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The
Chemical Age

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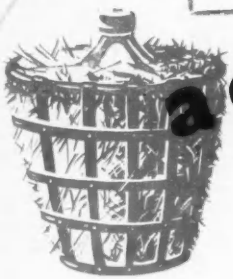

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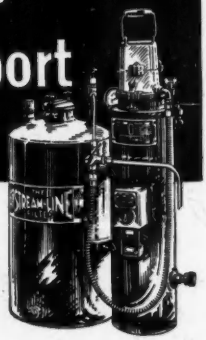

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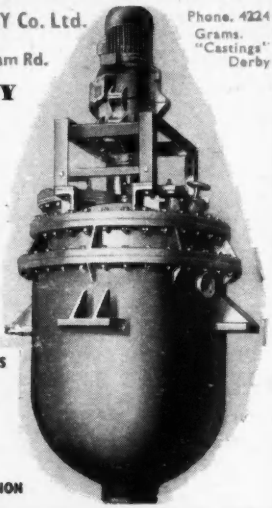

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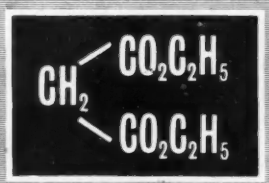

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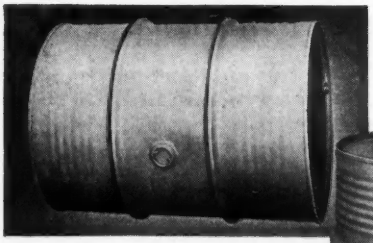

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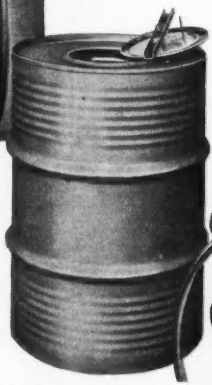

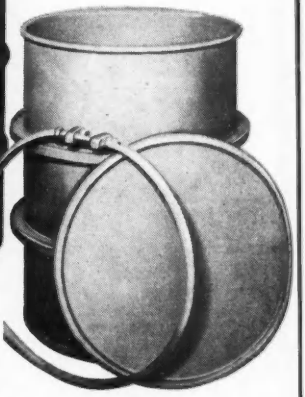

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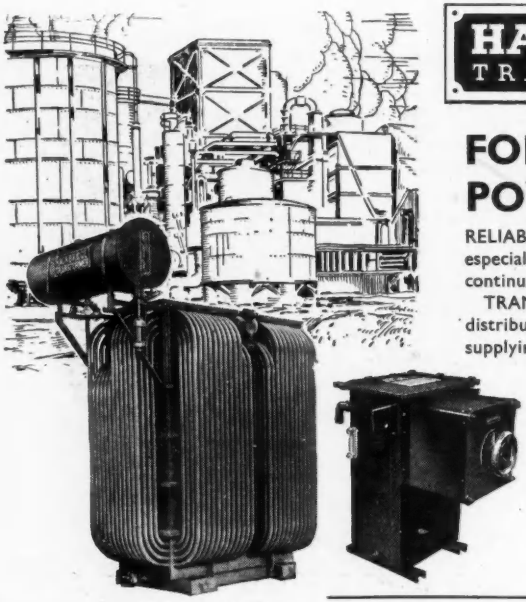

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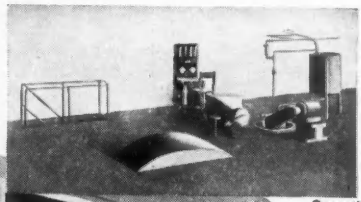
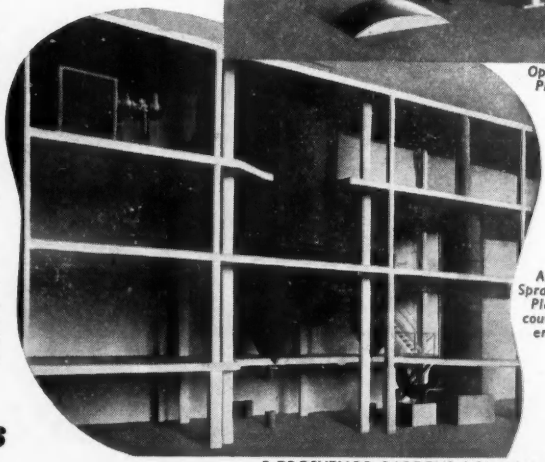


Operating Platform



A large Spray Drier Plant in course of erection.

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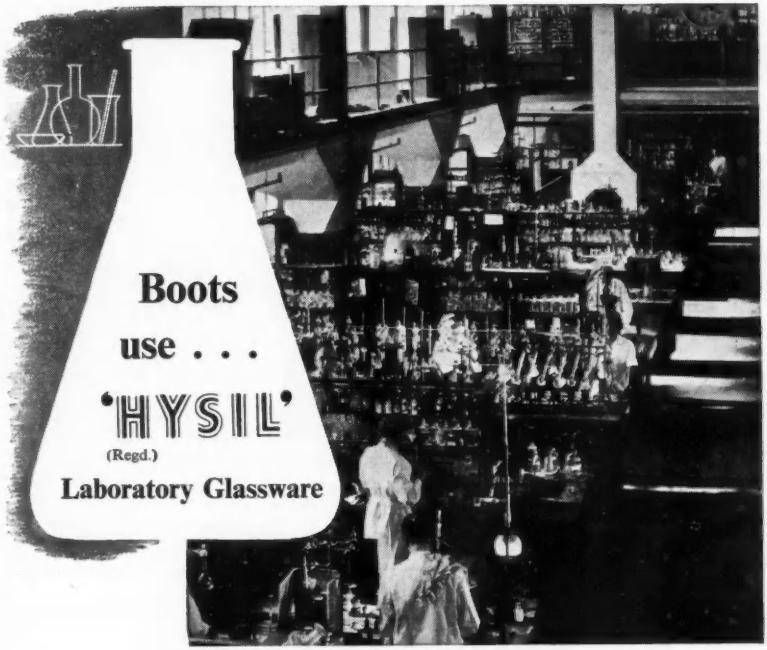

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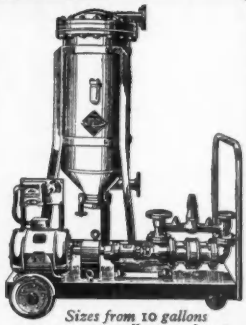

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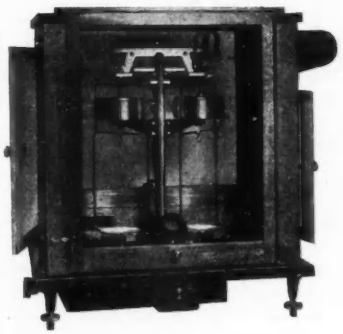

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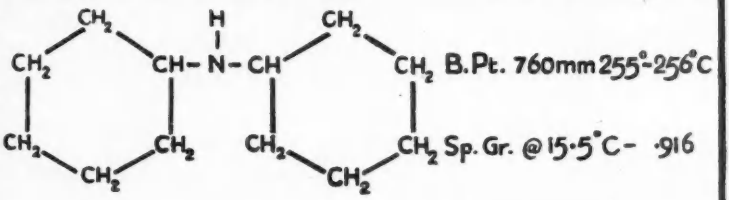

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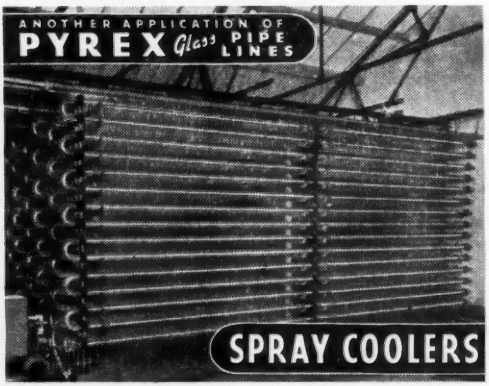

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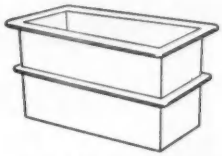

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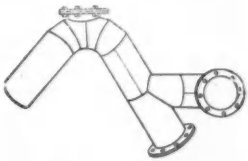

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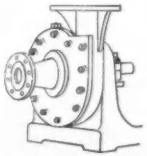

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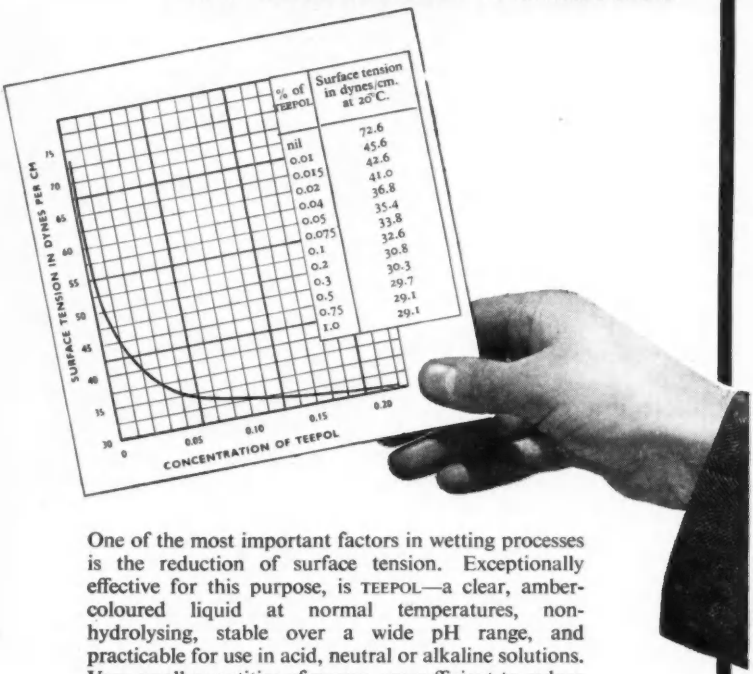
TEEPOL for the reduction of SURFACE TENSION



% of TEEPOL	Surface tension in dynes/cm. at 20°C.
nil	72.6
0.01	45.6
0.015	42.6
0.02	41.0
0.04	36.8
0.05	35.4
0.075	33.8
0.1	32.6
0.2	30.8
0.3	30.3
0.5	29.7
0.75	29.1
1.0	29.1

One of the most important factors in wetting processes is the reduction of surface tension. Exceptionally effective for this purpose, is TEEPOL—a clear, amber-coloured liquid at normal temperatures, non-hydrolysing, stable over a wide pH range, and practicable for use in acid, neutral or alkaline solutions. Very small quantities of TEEPOL are sufficient to reduce the surface tension of water by as much as 30 dynes per cm. The graph illustrates the general effect of TEEPOL as a reducer of surface tension.

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The
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The Weekly Journal of Chemical Engineering and Industrial Chemistry

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Volume LXII 10 June 1950 Number 1613

The New India

THE dominant theme in India today, and to a large extent in Pakistan, is the determination to discard the role of supplier of raw materials and importer of finished goods. The effects of that policy have brought marked contraction of some British export totals—and no immediate portents of prosperity for India. One of the few things that are certain about this is that the new policy will not be lightly relinquished, despite the fact that acute shortages have enforced some moderation of the limitation of imports. The other is that India's, and probably Pakistan's, emergence as a manufacturer will not be accomplished without great struggle and some tribulation.

Two recent books by Indian scientists reveal the great tasks that lie ahead for Indian science and stress the intellectual capacity of her scientists. A. K. Madan's "Economic Prospects of Chemical Industries in India" (Thacker & Co., Bombay, 1949) presents the views of an industrial chemist; while Dr. A. N. Puri's "Soils, Their Physics and Chemistry" (Reinhold Publishing Corp., U.S.A., 1949) shows that Indian scientific research and thought can reach the highest levels of originality and imagination. The two books offer an extreme contrast in outlook. A. K. Madan's account of Indian industrial science is largely a survey of what still needs to be established, of what India could produce for herself but still does not. Dr. Puri's longer book is an outstanding and controversial contribution to soil science, and his re-examination of many orthodox conceptions will win respect and possibly much support from soil scientists elsewhere. More than a quarter of a century of distinguished personal research has led Dr. Puri to a point when he feels able to suggest new approaches to the fundamental changes, chemical and physical, which occur in all soils. That enabled him to offer a stimulating contribution to scientific thought, one that is not in any way limited to Indian conditions.

Mr. Madan's survey of chemical industries—a "masterpiece," if we are to believe the publishers—reveals how far India has yet to go before attaining even partial self-sufficiency in the manufacturing field. A summary of standard industrial chemical processes which are conducted in most countries but have still to be introduced to India takes up much of his space. It is revealing that so much

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The annual subscription to THE CHEMICAL AGE is 30s.; single copies, 9d.; post paid, 1s. SCOTTISH OFFICE: 116 Hope Street, Glasgow (Central 3970). MIDLANDS OFFICE: Daimler House, Paradise Street, Birmingham (Midland 0784-5). THE CHEMICAL AGE offices are closed on Saturdays in accordance with the adoption of the five-day week by Benn Brothers, Limited

"bread-and-butter" chemical industry should have to be presented as India's *future* prospects. "So much to do, so little done" might be the motif of Mr. Madan's survey, and when he deals with India's resources he invites the gloomier rider "and so little to do it with!" It is clear that there cannot be any notable expansion in India's production of chemical necessities unless a much bolder effort is made to find and develop new mineral resources. Although she has long been regarded as a storehouse of raw materials by other manufacturing countries, India lacks many of the key minerals for heavy chemical industry.

India possesses excellent supplies of iron and manganese ores, bauxite, barytes, chromite, salt, mica, thorium and cerium ores and ochres. Her gypsum and limestone resources are poor. But her coal reserves are bad and her petroleum oil fields so few and small that their output must be written off as insignificant. Supplies of tin, lead, zinc and copper ores are bad; potash and phosphate deposits are negligible. It is difficult to believe that so large and old a section of the world's crust cannot yield more than this. Partition, however, has not helped India's mineral economy; for example, one of the best gypsum deposits, which had been expected to serve India's synthetic fertiliser industry, is now out of reach within the frontiers of Pakistan. India possesses plentiful iron ores, but iron ores without coal in similar abundance cannot make a steel industry.

The technical development of other sources of power and of materials will require vast numbers of scientists and technologists. It may be asked how, without a vigorous chemical industry *now*, can India develop that army of industrial scientists she will need in the future? Education and opportunity go together. Of education, Mr. Madan says: "The technical institutions can easily be counted on finger tips" . . . and "the industrialists and capitalists engage their own people . . . irrespective of merits. The key posts in the various departments of Government services are usually distributed in a similar way. . . . Some of the finest brains are allowed to rot . . ." If these comments are true—and Mr. Madan's book is objectively written without any rhetorical interludes—they indicate a precarious foundation for industrial and scientific expansion.

Notes and Comments

Competition

"GONE are the days when, for many products, we were unable to produce enough for all our customers at home and overseas and had to resort to rationing of one kind or another. . . There was a time when it was possible, and indeed our national duty, to obtain enhanced prices for our exports, and, but for the prices we received in our export markets, we should not have been able to keep our home prices so low. To-day we must keep a most careful eye on our prices if we are not to lose business to keen competitors." Lord McGowan on Wednesday summed up in those terms to shareholders of I.C.I. the most important of the changes to which many chemical industries now are bound to adapt their programmes. To indicate how well I.C.I. has been able to accommodate itself, the chairman made good use of the fact that the total turnover in 1949, £174 million, was £10 million more than it was a year before and the export return was also larger. Meanwhile, costs are rising—of materials, labour and especially of plant—and margins are shortened. The sellers' market is a thing of the past and the need now to secure every economy which heightened efficiency and prudent saving can procure has evidently acquired an urgency far greater than ever before. Nothing could be more favourable to progressiveness in industrial chemistry, a quality in which this country is certainly not deficient.

Economical Handling

THE need of higher productivity and the spreading of new techniques to achieve it are the urgent aims of the moment adding considerably to the interest of the current exhibition at Olympia of large-scale mechanical handling and the conferences to be held this month by the Institution of Production Engineers and the British Institute of Management. Both conferences have regard for the importance which industry attributes to the subject of mechanical handling. The subject was effectively introduced by the recent publication of "Materials Handling in Industry", a report by the Anglo-American Council on Productivity, prepared by a team which visited the U.S.A. towards the end of last year. The belief that better handling can save America at least $2000 million a year is supported by the extensive growth, noted in the report, of mechanical aids which already have greatly reduced costs. In Britain, where manufacturers have in the past had less urgent need to study all possibilities of "streamlining" production, a comparable economy might well be achieved. A chart in the report shows the work involved in the preparation of a small diecasting of aluminium alloy. Of the 54 operations, from the unloading of the ingots to transport of the finished casting to the assembly bay, only eight had been pre-planned and time studied. Several operations of the non-productive kind could be eliminated; others could be combined. An additional argument for fuller mechanical handling is the benefit it confers on the industrial worker, by the reduction of hazards and unproductive "donkey work" which only 20 years ago might have been considered unavoidable.

Case for Tax Repeal

A LITTLE brochure just issued by the Industrial Light Oils Committee—a composite body consisting of representatives of 17 of the using trades' associations—sets out a strong case for the repeal of the duty on light hydrocarbon oils used for industrial purposes and not for road use. An arresting coloured cover emphasises that Great Britain is the only major industrial country where no remission of tax on these oils is accorded to industrial users. In a foreword, the

committee points out that the duty, earlier a grievous burden at the original rate of 9d. a gallon, will at the new figure of 1s. 6d. be most damaging to the capacity of many manufacturing industries, such as paint, polishes, linoleum, printing inks, cellulose lacquers, and plastics—to compete in export markets and to offer minimum prices to the home consumer. An appendix on the description and uses of industrial hydrocarbon oils subject to the so-called petrol tax. It is significant that Italy and Western Germany, now recovering their economic freedom and capacity to compete with the United Kingdom in overseas markets, have both granted a preferential rate of duty on light oils used by their industries.

Atomic Fuel Bill

THE welcome lull in the past few months in the spate of "electrifying" news and views, generally unbalanced, about atomic fission in bombs or in industry was interrupted at Oxford on June 2, by one of the infrequent authoritative summaries which help to keep the topic reasonably in perspective. Giving the Romanes Lecture in the Sheldonian Theatre, Sir John Cockcroft indicated that the first major objective in what has come to be regarded as the "ten-year plan" for industrial utilisation was to perfect economical extraction of low-grade uranium ores (20 times as abundant as silver) and the second to develop the "breeder" pile, yielding secondary fuel, possibly faster than it disintegrated U_{235}. Harwell is to build one "in due course". Those requiring a definition of the latter phrase found firmer ground in the principal atomic scientist's view that we may see specialised units for nuclear power within the next five years. He gave as a condition for that much to be desired culmination the successful use of 1 per cent uranium. Then, in an atomic powered generating station, one ton of uranium ore would replace the 300 tons of coal required in conventional generators. Such saving, however, would not pass intact to the profit account. Much of it would be required to offset the high chemical engineering costs for uranium extraction and metal making. That invites speculation whether some specialist chemical engineers and physicist collaborators will one day direct expenditures nearly as large as the National Coal Board's—perhaps much more fruitfully.

Temperature Changes of Metals

THE custom of regarding the melting and solidifying points of metals as being identical for all practical purposes will have to be reconsidered in the light of the magnitude of the disparities now recorded by U.S. metallurgists, notably by Dr. David Turnbull, of the G.E.C. research laboratory. Workers there say they have established that metals of extreme purity solidify at temperatures very much below their known melting points. The difference between the two fixed points has been described as a fairly uniform 20 per cent and is said to have been proved for selenium, bismuth, lead, antimony, cobalt, iron and palladium. The uniformity of results so far suggests the same result may be found for the other metals now being subjected to microscopic tests in a temperature-controlled metal chamber with a quartz observation window. The answer to the natural question why so fundamental a fact has escaped the attention of the metal industries is that it has very little importance for their practical purposes. Only the purest metals obey this apparent law; the smallest impurity is said to produce a very large rise in the temperature at which solidification occurs.

International Conference on Atomic Energy

Two hundred atomic scientists from the Western countries are expected to attend the first large international conference to be held in Britain on nuclear physics. Organised by the Atomic Energy Research Establishment, Harwell, the conference will be held at Oxford from September 7-13.

TAX ON HYDROCARBON OILS

Official Explanation of Categories

THAT a good deal of uncertainty exists in regard to the imposition of tax at the rate of 9d. a gallon on hydrocarbon oils, particularly as to which oils are subject to it, is confirmed by a letter to *The Times* last week from a manufacturer of chemicals. This correspondent pointed out that no one appears to have tried to explain why hydrocarbons such as benzol, xylol, naphtha, etc., should be subjected to the additional 9d. a gallon tax, these materials being entirely obtained from coal tar produced in this country.

Another point raised by this manufacturer is that these solvents, essential as they are in many sections of the chemical and related industries, form part of innumerable products which are exported. The tax, therefore, which in some cases increases the cost of the solvent by 25 per cent, puts the industry in an even more unfavourable position in making goods for export.

The writer claims that, where these solvents are used for chemical conversion the tax is, apparently, remitted, so that in some factories a proportion of the solvents is taxed and the rest may be free from tax.

What Are "Light Oils"?

The official Customs and Excise explanation of what is meant, for purposes of this tax, by the term "hydrocarbon oils," is petroleum oils, coal tar and oils produced from coal, shale, peat or any other bituminous substance, and all liquid hydrocarbons; but it does not include hydrocarbons or bituminous or asphaltic substances which are solid or semi-solid at a temperature of 60° F. (in accordance with tests prescribed by the Commissioners of Customs and Excise). The term "light oils" means hydrocarbon oils of which not less than 50 per cent by volume distils at a temperature not exceeding 185° C., or of which not less than 95 per cent by volume distils at a temperature not exceeding 240° C., or which give off an inflammable vapor at a temperature of less than 22.8° C. when tested in the manner prescribed by the Acts relating to petroleum. In other words, this additional 9d. a gallon tax applies to a whole category of oils, whether they were imported or not.

The term "heavy oils" means hydrocarbon oils other than light oils. "Heavy oils (road fuel)" means heavy oils used as fuel for a mechanically propelled vehicle constructed or adapted for use on roads.

A rebate of 9d. per gal. is allowed on the delivery for home consumption of heavy oils (other than heavy oils (road fuel)) which contain in solution hard asphalt in amount not less than 0.5 per cent; of heavy oils (other than heavy oils (road fuel)) of which not more than 50 per cent by volume distils at a temperature not exceeding 240° C. and of which more than 50 per cent by volume distils at a temperature not exceeding 340° C.; and of heavy oils other than heavy oils (road fuel)) of which more than 50 per cent by volume distils at a temperature not exceeding 240° C. (These definitions relate to oils generally described as fuel oil, gas oil, diesel oil and kerosene.)

Duties Payable

A rebate at the rate of 8d. per gal. is allowed on the delivery for home consumption of other heavy oils (except heavy oils (road fuel)). The duty payable is thus 9d. per gal. on light oils; 9d. per gal. on heavy oils (road fuel); and 1d. per gal. on other heavy oils (e.g., lubricating oil), except those stated above to be subject to rebate, which are in effect duty free.

It is illegal for any person to mix any oil on which rebate has been allowed with any light oils unless he has been granted a licence for this purpose by the Commissioners of Customs and Excise and has, before mixing, paid the amount of duty which would have been paid if the rebate had not been allowed.

Repayment of duty is allowed in respect of any hydrocarbon oils which have been used on board British registered fishing boats, and of hydrocarbon oils other than light oils used as fuel for the machinery of vessels, other than pleasure yachts, while engaged on a voyage in home waters.

In the case of hydrocarbon oils in or removed to a refinery, duty is charged on the delivery of any goods from the refinery and is the same as that which would be payable on the importation of the same goods, and the same rebate as would be allowed on importation is allowed.

(*continued overleaf*)

PETROLEUM PITCH

Superior Bonding Properties

ONE of the by-products of the Catarole cracking process by which chemicals are produced from petroleum at Partington is Catarex pitch, introduced by Petrochemicals, Ltd.

This material, which is odourless and tasteless, can be supplied to any specified melting point within the range of 40° to 100° C.

It is said to possess properties which in many repects lie between those of straight run petroleum bitumen and coal tar pitches. In absence of nitrogen and oxygen compounds and in its very low sulphur content it is claimed to be superior to both these products.

Important characteristics of the pitch are the low free carbon and ash content which make possible its specialised application in the electro-metallurgical field. High temperature susceptibility and relatively high coking value make it of particular interest for the impregnation of carbon fabrications where a high carbon content would result in the formation of scum on the surface of the material being impregnated.

The pitch shows good bonding properties and, when combined with a platiciser, may be used successfully for the protection of metal surfaces. With suitable treatment, this material should prove of value for use in tank-lining, pipe enamels, bitumastic paints, rubber reclaiming, the electro-metallurgical and cable industries, etc.

TAX ON HYDROCARBON OILS

(*continued from previous page*)

The effect of the impact of the tax on commercial road users' cost was forcibly expressed by Colonel Arthur Jerrett, president of the Traders' Road Transport Association, the national organisation for "C" licence-holders, who was the spokesman for a deputation representing all motor vehicle users and manufacturing and trade interests recently received by Mr. Hugh Gaitskell, Minister for Economic Affairs, at the Treasury.

The deputation presented the case for the remission of the extra tax on petrol and the purchase tax on commercial vehicles proposed in the recent Budget. Colonel Jerrett said that the trade and industry of this country were "very definitely shocked by the Chancellor's proposals," and the additions to the cost of operating commercial road transport had already led to a material increase in goods transport charges.

MORE PRICE RISES

High Rates for Base Metals

AN immediate increase in the price of refined nickel in the United Kingdom was announced on June 1 by the International Nickel Company of Canada and its associated companies, the International Nickel Company, Inc., U.S.A., and the Mond Nickel Company, Great Britain.

The new price fixed by the Mond Nickel Co. in the U.K. is £386 a ton, delivered, compared with £321 10s. a ton established on September 21, 1949. Appropriate increases are made for other countries.

It is pointed out by the company that these prices correspond to those announced for Canada and the U.S.A. They represent an increase of only 40 per cent above the average price prevailing for all markets in the pre-war years, compared with increases for other base metals varying from 65 to 125 per cent.

The present increase is stated to have been brought about by higher rates of pay for labour and for supplies and services and to be necessary to compensate for the rise in costs which have mounted steadily since before the war.

Sharp Rise in Zinc Prices

An increase in the price of good ordinary brand zinc by £12 a ton, from £111 10s. to £123 10s. a ton delivered, was announced on June 4. This fresh rise was the third increase within 10 days, the price being advanced by £4 a ton on May 25 and by the same amount again on May 30. Prices of other grades were increased in accordance with the latest rise.

£16 More for Copper

An increase in price of electrolytic copper by £16, from £170 to £186 per ton delivered, was announced by the Ministry of Supply on June 6. This followed an increase in the U.S. prices the previous day. Copper has thus increased in value £22 in less than three weeks.

Further increases in the prices of U.S. zinc were announced on June 5.

Linseed Oil Prices

DURING the four-week period ending July 1, the following alterations in the prices of unrefined oils will apply: Linseed oil from £132 to £134 per ton; linseed oil foots from £82 to £84 per ton, both naked ex works. Prices of all other unrefined oils and fats and technical animal fats allocated to primary wholesalers and large trade users will remain unchanged.

RAPID MECHANICAL HANDLING

Equipment of Interest to the Chemical Industries

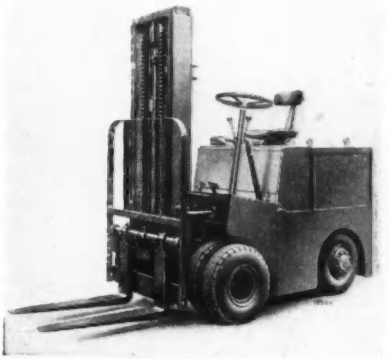
MUCH of the equipment and apparatus on show at the second National Mechanical Handling Exhibition, which opened at Olympia, London, on June 6 and continues until June 17, is again of the type designed for the lifting and stacking of goods in packing cases, but there are also a number of exhibits of particular interest to the chemical industries requiring to handle raw materials in bulk.

The whole includes pneumatic lifting apparatus for use where the electrical types are unsuitable owing to the danger of sparks near explosive materials; fork lift trucks of a design already in use in a number of chemical works for handling drums; conveyors and exhaust apparatus for removing dust and fumes; instruments for the accurate measurement of liquids; a flameproof vibrator for use in explosive atmospheres in mines, etc.; and a light weight, high speed bag-filling machine, for packing nitrates and other chemicals.

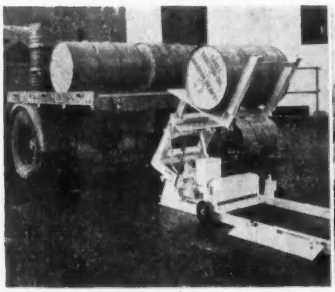
Mobile cranes, like the many kinds and designs of trucks exhibited, have been rendered still more manœuvrable in confined spaces. They can lift up to 20 tons, but a 12½-ton model with a 100 ft. jib, by HENRY J. COLES, LTD. (centre of Grand Hall), was the largest that could be brought into Olympia. Electronic control, to give precise positioning of lifting gear, was demonstrated at the 1948 Mechanical Handling Exhibition; now remote radio control of the movements of a crane or hoist is being employed.

Conveyors shown include at least one of new design for quicker operation, and the full-scale overhead chain conveyors being displayed, as used in production lines, are now being designed to carry loads of a few ounces or of over a ton. Here there are automatic means of shunting into "deadlines" or sidings for inspection, etc., and of unloading.

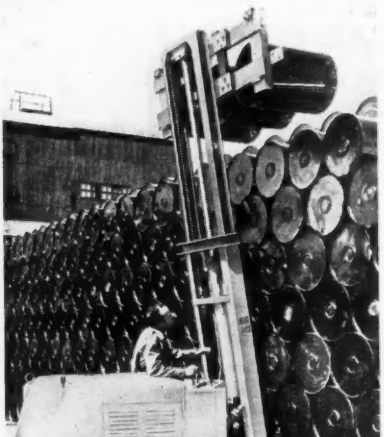
Delivery dates, for the filling of both home and overseas orders, are generally reported to be much more satisfactory



Electric fork truck, by Ransomes, Sims and Jeffries, Ltd., with telescopic lifting gear and tilting masts, which can lift 2 tons 10 ft. in under 10 seconds



Mobile lorry loader by R. H. Corbett and Co., Ltd., which lifts and stacks in 5 sec. barrels, drums or crates weighing up to 7 cwt. which can be tilted through 90 degrees. Right: A 40-ft. stacker by Crone and Taylor, Ltd., handling coke at a gas-works; it can stack to a height of 20 ft.



Fork lift Conveyancer truck, by Electro-Hydraulics, Ltd., handling caustic soda at the General Chemicals Division works of I.C.I.

than in 1948, when the last exhibition of this kind was held and when the post-war production of many of the items of equipment now exhibited was in its early stages.

Among the many exhibits of the modern fork-lift truck is that of ELECTRO-HYDRAULICS, LTD. (Stand A.3 Grand Hall), which is showing the Conveyancer Mark II unit. This type is already in use at the works of the General Chemicals Division, I.C.I., and other large chemical centres. It has a capacity of 30 cwt. and lifting and lowering speeds of 9 ft. in 15 seconds. The maximum speed of the truck, forward or reverse, is approximately 10 m.p.h. Its overall width and length are, respectively, 38½ in. and 77 in. and its overall height telescoped is 79½ in. and fully extended 133½ in.

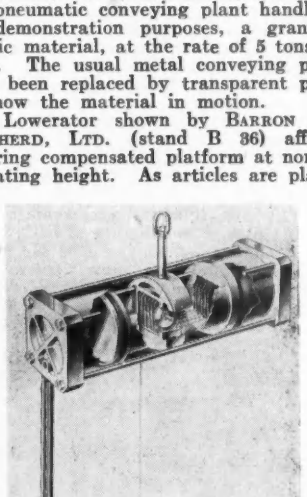
Lifting appartus of special interest to the chemical industry is displayed by MARTON AIR EQUIPMENT, LTD. (Stand H 1c, National Hall). The Marton air hoist is being used in many chemical and other works where the electrical type of hoist cannot be employed owing to the risk of spark ignitions. Special features are the balance effect for easy positioning of load; the variable speed, from a creep to maximum at will, simply depending on the amount a push button is depressed. It is claimed that it cannot be damaged by overloading; there is no risk of fire; it is silent in operation and occupies the minimum of headroom.

A 15-ft. long working model of a railway marshalling yard is shown by MOXEY CONVEYOR AND TRANSPORTER CO., LTD. (stand C 1, Grand Hall). Wagons are shunted on to a wagon tippler which tips into a concrete storage bunker which feeds a belt conveyor. This takes the material up to a junction tower and on to a washery building.

On the stand of FRASER AND CHALMERS ENGINEERING WORKS (stand A.15) is a working model, one-eighth full size, of a wagon tippler. Also on show is electro-magnetically operated vibrating equipment which separates, by means of a screen and also re-mixes two different sized materials (distinctively coloured for the demonstration).

The main exhibit of SIMON HANDLING ENGINEERS, LTD. (stand B 10b) is a working pneumatic conveying plant handling, for demonstration purposes, a granular plastic material, at the rate of 5 tons an hour. The usual metal conveying pipes have been replaced by transparent pipes to show the material in motion.

A Lowerator shown by BARRON AND SHEPHERD, LTD. (stand B 36) affords a spring compensated platform at normal operating height. As articles are placed



Air hoist by Marton Air Equipment, Ltd.

on the platform it descends according to the weight applied, but the spring compensation always keeps the top of the articles at the same operating height. A model at present being developed will carry a 3¾ ton load of steel bars. A roll-race conveyor, claimed to have the highest efficiency of any conveyor in the world, is being shown by this firm. It is a load-carrying belt running on a continuous roller-race, and can be silent in operation.

A new gravity conveyor on show by LAMSON ENGINEERING CO., LTD. (stand B 38) weighs only 29 lb. an 8-ft. length but will carry a load of 150 lb., evenly distributed.

Claiming to be the largest designers and producers of pallets in this country, PALLETS, LTD. (stand F 7), shows a new paper-board expendable type. The firm claims that goods can be sent anywhere in the world by land, sea or air on these new pallets.

On show by J. STONE AND CO., LTD. (Stand B 9) are lightweight stillages of aluminium alloy cast in one piece. It is claimed that these are non-corrodable and can be cleaned with water or steam—an advantage in food and confectionery factories.

A mobile lorry loader which will lift a load of 7 cwt. to a height of 4 ft. 6 in. in five sec. is among the exhibits of R. H. CORBETT AND CO., LTD. (stand C 14). Two versions of this model are shown, one for loading any barrel, drum, cask, bale or crate that can be tilted through 90°, and the other for " this side up " loads which must not be tilted. A barrel lifter and dispenser which lifts 2½ times its own weight is also on show.

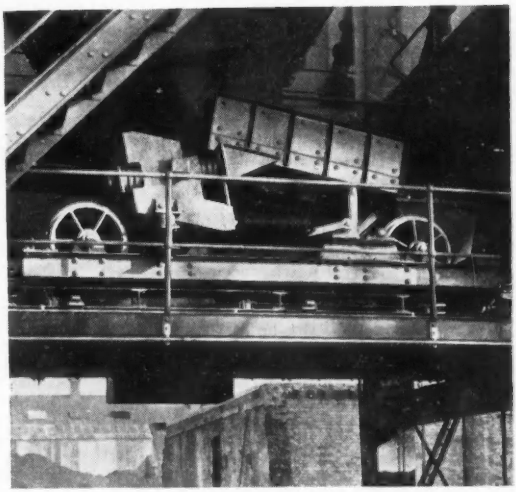
A 25-ft. stacker which will hump anything from 7 lb. packages up to 2 cwt. boxes is exhibited by CRONE AND TAYLOR, LTD. (stand A 31). It is claimed that it has stacked 1000 ½-cwt. cartons per hour, with one man feeding and one man taking off, at a height of 16 ft. 8 in.

Chemical Concessions to Germany

RELAXATION of control over certain German chemicals announced this week marked an important stage in the progressive easing in the industrial field of the restrictions framed to ensure disarmament and demilitarisation.

The new regulations issued under the allied High Commission's law number 24 remove the restrictions on poison war chemicals with peacetime application, industrial explosives and their accessories, white phosphorus and chlorine. Strict control, however, is to be retained over war explosives, certain rocket fuel chemicals, and poison war gases not adaptable to peacetime uses.

Increased responsibility for administration of the law is given to German authorities who now, subject to the approval of the Military Security Board, may issue permits for the manufacture of a large class of war chemicals required for peace economy, such as industrial explosives, liquid oxygen, and ammunition for civil security and sporting purposes.



Sherwen electromagnetically-operated vibrating equipment, with 4 ft. by 18 ft. medium duty feeder. This is one of the exhibits of the Fraser & Chalmers Engineering Works

English Chemists in Holland

Cordial Reception of the Fine Chemicals Group

THE first overseas tour by the Fine Chemicals Group of the Society of Chemical Industry, May 6 to 13, afforded a party of 23 a memorable experience of the warm hospitality of Dutch chemists and of the advanced industrial chemistry and natural beauty of Holland. The party made the crossing to Amsterdam in two sections, by sea and by air, accompanied by Dr. F. Hartley and Dr. G. M. Dyson. A long and highly successful programme of visits to plants and laboratories and to a great many other places of general interest in Holland was arranged by Dr. Dyson and Prof. P. E. Verkade.

The English chemists and the seven ladies of the party were given an official reception in Amsterdam by the Nederlandsche Chemische Vereniging, and welcomed by Prof. H. J. C. Tendeloo (president of the Dutch Chemical Society) and Prof van der Linden and some 40 members of the Dutch Chemical Society.

Dutch Research Group

A visit on May 8 to the Royal Dutch-Shell laboratories at Amsterdam gave a valuable insight into the scope of the Shell research groups, described by Dr. G. H. Visser, director of new products research, and of the character and objectives of the Dutch research group. The visitors were able to see some of the work in progress on plant protection products and pesticides, the advanced spectroscopic equipment (ultra-violet and infra-red spectra) in the physico-chemical laboratories and the equally fine equipment for experimental distillation and studies of catalysis. Lunch and tea were provided in the laboratories.

The next visit of technical interest, after a wide programme of sightseeing tours, was on May 10 to the factory of N.V. Organon, at Oss, where the scientific director, Dr. M. Tanske, received the chemists and described some of the work going on. Films were shown illustrating the value of adrenocortico trophic hormone (ACTH) manufactured by N.V. Organon, in the treatment of rheumatoid arthritis. After lunch, at which Mr. Saal van Zwanenburg, president of the company, welcomed the guests, parties under Dr. Lens, director of research, and Dr. Veer, director of the research institute, toured the laboratories and factory.

Among plant shown and processes described were those for the manufacture of oestrone, steroid hormones, ACTH, insulin, heparin, protein hydrolysate, DDT and liver extract. In the research laboratories experiments were in progress for the purification of vitamin B_{12}, the standardisation of ACTH and suprarenal extracts.

On May 11 the group travelled on to Venlo in south-east Holland, near to the German frontier, to visit the laboratories and works of Chemische Fabriek L. van der Grinten.

The English chemists were received, on May 12, at the Technische Hoogeschool by Professors Dr. G. Meyer, Dr. P. E. Verkade and their colleagues. The group held there the fifteenth meeting of the Fine Chemicals Group and its first overseas scientific meeting.

Dr. G. M. Dyson, in a lecture "Chemical Literature and Chemical Advancement," described the simplified system of nomenclature he has devised to facilitate and improve the efficiency of reference, classifications and indexing of chemical compounds. Professor Dr. P. E. Verkade gave an account of the research work carried out in his department on the alkoxy nitroanilines and discussed the relations between physico-chemical and biological properties in the series.

In the afternoon parties were conducted over the magnificent newly-equipped laboratories for inorganic and physical chemistry, organic chemistry and pilot plant work. The excellence of the technical university of Delft served to remind the group of the need for further action in Britain to cater for the training of chemical technologists.

On Friday evening the completion of the programme of the group was marked by a farewell dinner at Hotel Kurkaus, Scheveningen, to friends who had made the group's Holland tour so successful.

French Sulphur

The sulphur seam at Malvezy, near Narbonne (Aude), France, is being actively exploited. The seam is 40 m. thick and has an average content of 8 per cent sulphur. It is an opencast working and the work is fully mechanised. The ore is enriched by treatment to provide up to 85 per cent sulphur and then purified by fusion, giving, it is stated, a finished product of over 99 per cent purity. The refining plant is being increased to a daily capacity of 1200 tons.

EVALUATING THE SOLVENTS

Characteristics of Some New Materials for Plastics

From A CORRESPONDENT

A NUMBER of new solvents are now being made available to the plastics industry for use in formulating adhesives, protective coatings and numerous plastic compositions for forming, spinning and spreading. An important result of the development of new organosol techniques, in which high solids suspensions of special fine-particle grades of vinyl resins are made in solvent systems containing large proportions of hydrocarbon diluents, has been the creation of new demands for solvents.

Some of these solvents are of special value in the processing of the newer polymers, *e.g.*, methylal (dimethoxy methane), a chemical with broad solvent properties, and an effective solvent for polystyrene, ethyl cellulose, polyvinyl alcohol and cellulose propionate. The five-membered cyclic ether, tetrahydrofuran, is a very effective solvent for polyvinyl chloride type resins and succinonitrile is a solvent for polyacrylo-nitrile, now being extensively developed as a fibre-forming resin.

Resin Solvents

Some of these new fluids are very active solvents for specific resins, *e.g.*, isophorone is one of the most powerful solvents for nitrocellulose. This cyclic ketone is also a very good solvent for vinyl co-polymers, such as Vinylite. The unsaturated ketone, mesityl oxide, is another powerful solvent for nitrocellulose and ethyl cellulose and dissolves low-viscosity cellulose acetate. It is one of the most satisfactory solvents for polyvinyl chloride and is effective with high molecular weight vinyl co-polymer resins.

The range of new solvents includes many latent solvents which can be used to extend other solvents. Methylal, for example, possesses outstanding latent solvency for nitrocellulose and the vinyl resins, or as a latent solvent to extend acetone and the esters when a low boiling solvent is required. Lower viscosities and higher dilution ratios result.

It is not uncommon to find that active solvents for some resinous compounds are important latent solvents for others; methyl isobutyl carbinol is a good solvent for ethyl cellulose and an excellent latent solvent for cellulose esters, particularly nitrocellulose.

A large number of hydrocarbon diluents, including aromatic, aliphatic and naphthenic hydrocarbons, are now available to the plastics industry as non-solvents or diluents. The cycloparaffins, for example, cyclopentane, possess solvent powers intermediate to those of the corresponding aromatics and paraffins. The usefulness of many solvents depends to a large degree upon miscibility and rate of dilution with cheap non-solvents.

Efficient Commercial Vehicles

In the formation of solvent-systems for plastics end uses it is usual to employ several actual solvents, carefully selected and balanced to provide the most efficient and economical vehicle. For nitrocellulose paper lacquers it is not uncommon to use five or six solvents, such as ethyl alcohol, butyl alcohol, toluene, ethyl acetate and butyl acetate. A typical blend of solvents for this application consists of 10 per cent ethyl alcohol, 10 per cent butyl alcohol, 50 per cent toluene, 10 per cent ethyl acetate and 20 per cent butyl acetate. Here the diluent, toluene, is carefully balanced by the relatively high percentage of the high boiling solvent, butyl acetate.

Some solvents are used to reduce viscosity, improve gloss, increase flow, etc. Acetonylacetone is employed as a high-boiling solvent in nitrocellulose and vinyl co-polymer resin solutions and has the unique property of greatly reducing their viscosity, even when present in small percentages.

Suitable Evaporation Rate

Some factors influencing choice of solvents for synthetic resins can be summarised as follows:—

1. One of the most important considerations in choosing a solvent for some specific purpose is to ensure that its evaporation rate is suitable for the application. Some solvents have a boiling point too low for certain types of applications, while others are practically non-volatile and have a high boiling point. In many paint and varnish and printing ink applications the evaporation rate of the solvent used largely determines the appearance of the applied film and the speed of operation.

In the coating or lacquering of paper with nitrocellulose compositions it is necessary to choose a solvent system to suit the

speed of coating and drying conditions. For a high speed drying coating a solvent blend made up of low boiling solvents is needed. One of the new fast-evaporating solvents is nonyl acetate, which has a boiling point 87-92° C. (10 mm.), This has a high solvent power and should find application as a component of nitrocellulose and other lacquers and enamels.

In plastics manufacture, such as the development of organosol techniques, the intermediate to slow-evaporating solvents are of the greatest importance. Here the comparatively new solvent, di-isobutyl ketone, boiling range 111 to 117°C., is being used as one of the solvent constituents of vinyl co-polymer dispersions for the production of thin-walled articles by dipping. Slow-to very slow-evaporating liquids include such new alcohols as 4-tert-amyl cyclohexanol ($C_5H_{11}C_6H_{10}OH$), boiling range 244-252° C.

Degree of Solvency

2. Classification according to solvent strength is very difficult as it is not easy to determine the degree of solvency as applied to resinous substances other than nitrocellulose. The latter has been used as the standard for many years. Although attempts have been made to evolve dilution ratio tests using vinyl, acrylic and other plastics, there is, as yet, no well-established method which is widely applicable. It is generally considered that the only reliable guide to solvency is that indicated by experience, which sets out the cyclic and unsaturated ketones as being the most active solvents, followed by the nitroparaffins, aliphatic ketones, ether alcohols and aliphatic esters.

The alcohols are usually classed as latent solvents and the hydrocarbons as non-solvents or diluents. This rule of thumb method is at the best a very rough indication of solvency and excludes such compounds as the amines, some of which are quite promising solvents.

Solvents do not always run true to type and there are many exceptions to rules. Amyl ether is unlike ethyl ether in that in the presence of alcohol it does not display only solvent power for nitrocellulose.

Solvent balance is of considerable practical importance in planning solvent systems and careful thought needs to be given to the part to be played by each solvent in a mixture or blend. Too great a disparity in the evaporation rates of solvent constituents should be avoided to prevent violent changes in composition due to uneven loss from evaporation. Such changes are liable to cause defects in the plastics product.

3. High in the list of factors controlling the selection and use of new solvents is chemical stability, *i.e.*, ability to be used with other solvents and substances and to be stored without suffering changes in composition. Methylal, for instance, is superior to ether and acetone for certain solvent extraction processes because of its stability to alkaline conditions and its general stability to a *p*H of 3. It also enjoys an advantage over ether of forming only minute quantities of peroxides.

This tendency to form peroxides is unfortunately characteristic of many solvents, and limits their general application.

Dioxane, which is an excellent solvent for cellulose acetate, ethyl cellulose, benzyl cellulose and many other resins, tends to form peroxides which are explosive. It is, possible, however, to reduce the risk of peroxides by adding a small quantity of reducing agent to the ether.

4. A solvent needs to be economical in use, and here specific gravity can play an important part. Methyl ethyl ketone has an economic advantage over ester solvents, because of its lower specific gravity. The resultant higher volume/weight ratio permits a greater volume of finished product to be manufactured from a given weight of solvent. On the other hand, the aromatic hydrocarbons as a class have a much higher molecular weight than the aliphatic hydrocarbons; but, volume for volume, the aromatics show greater solvency and produce less viscous solutions.

In the search for new diluents attention is now being given to ethyl benzene, iso-propyl benzene and tert-butyl benzene, all of which are medium-fast-evaporating solvents possessing somewhat similar properties to toluene. Some interesting cyclic hydrocarbons produced in refinery cracking operations are low boiling-point diluents of considerable promise, one of the most interesting being cyclohexene, which boils at 83.2° C.

Indian Plastics

PLANS to develop the production in India of a wide variety of plastics goods will be considered at a meeting of manufacturers to be convened shortly by Mr. J. N. Iyer, the plastic expert and a member of the All-India Plastic Manufacturers' Association. Early arrangements for setting up a plastics factory in Guindy, near Madras, have just been completed by Mr. Iyer.

If plastic cabinets were manufactured in India with a common approved mould, he considered that the cost of radio sets could be brought within the means of the common man and there would be considerable saving of foreign exchange.

ETHYLENE BY PARTIAL COMBUSTION

Advances Proposed by U.S. Oil Experts

THE principal source of ethylene to-day are paraffinic hydrocarbons which are thermally cracked in externally heated pipe stills. Operating temperatures are high (1500-1750° F.) and call for the use of expensive chrome-nickel alloys in the cracker pipes. Moreover, the thermal efficiency of the process is low and considerable quantities of fuel gas are consumed.

It has long been predicted that successful processes can be developed for the autothermic cracking of ethane and propane to form ethylene. The underlying principle is the thermal balancing of the endothermic cracking reaction by burning a portion of the paraffinic feedstock with admixed oxygen. The need for heat transfer through expensive tubular units is thus avoided, and considerable savings can be effected in reactor construction.

The Leuna System

During the war years, at least one German installation was based on such a process. I. G. Farbenwerke Leuna cracked up to 13,000 tons per year of ethane by partial combustion with oxygen of Linde-Fränkl purity (about 95 per cent). The process was carried out at one-half atmosphere absolute pressure and in the presence of large ceramic surfaces which favour the preferential burning of by-product hydrogen in the presence of hydrocarbons, thus raising the overall yield.

The maximum cracker temperature was 1620° F., ethane/oxygen ratio was 3 : 1. A stoichiometric ethylene yield of 60-65 per cent was obtained in a once-through operation. The product gases contained up to 31 per cent ethylene, along with unconsumed ethane, by-product hydrogen, some combustion products (11 per cent carbon monoxide, 1-5 per cent carbon dioxide) and miscellaneous by-products in small quantities.

No Oxygen

Principal objection to the process has been the need for expensive oxygen and the operating vacuum which necessitates recompression of the product gases before they can be successfully separated.

That these objections can be readily overcome has recently been reported by R. M. Deanesley and C. H. Watkins, of Universal Oil Products Company. Their study of process variables in the autothermic cracking of lower hydrocarbons for the preferential production of ethylene leads them to suggest the use of air instead of oxygen and operation at superatmospheric pressures with consequent savings in overall compression charges.

The chief promise of the new process is indicated in its application to ethane. Being particularly refractory to dehydrogenation and cracking, this hydrocarbon requires peak processing temperatures (or else particularly high recycle ratios).

Proper ethane cracking, carried out at 1650-1750° F. imposes a severe problem on selection and maintenance of tube metal in the pipe still. At the same time, ethane pyrolysis necessitates the use of a feed low in methane and hydrogen content, thus setting a definite pre-purification problem in many cases.

Ethylene producers have therefore generally preferred to use more expensive, but less troublesome propane as feedstock to the cracker, continuing to relegate ethane to the rôle of a nearly worthless by-product of petroleum processing.

Deanesley and Watkins now find that cheap methane may actually serve to raise overall efficiency of ethane cracking in partial combustion processing. Serving itself as fuel, methane can be shown to reduce the quantity of ethane which must be burned to supply the necessary heat of reaction in the cracker.

Pre-heating

Most important, if air is to be used, is the degree of preheating imparted to the cracker feedstock. Obviously the hot pyrolysis products may be used to preheat the incoming charge by countercurrent heat exchange. In the overall operation additional heat will have to be supplied to the feedstock for the final boost to reaction temperature. But the heat needed for this purpose depends on the efficiency with which the preliminary heat exchange function has been effected.

Obviously, in an autothermic process, it is essential that a small heat load as possible be imposed on the reactor proper. The heat supply is derived from feed hydrocarbon which is partly burned instead of being wholly converted to useful ethylene.

By minimising the reactor heat load (by high degree of preheating), the amount of reagent which must be burned is thus kept

low. At the same time the amount of diluent by-products—carbon dioxide, carbon monoxide, and nitrogen (if air is used)—depends on the amount of required combustion. By minimising the degree of burning, the ethylene recovery problem from the more concentrated reaction products is thus facilitated.

The underlying reactions for the ideal case of autothermic ethane pyrolysis at 1200°K are as follows:—

$C_2H_6 + 0.5\ O_2 = C_2H_4 + H_2O - 24.97$ kcal. (1)
$0.724\ C_2H_6 = 0.724\ C_2H_4 + 0.724\ H_2 + 24.97$ kcal. (2)

This means that the maximum yield of ethylene which can possibly be obtained is 3.448 moles per mole of oxygen.

In actual practice, considerable amounts of hydrocarbon are simultaneously burned to carbon monoxide and dioxide. In their experimental set-up (which was thermochemically only 50-60 per cent efficient), Deanesley and Watkins found the following distribution of oxygen in the reaction products:—

For an oxygen/ethane ratio of 0.2: -16 per cent in CO, 22 per cent in CO_2, the remainder in H_2O. For an oxygen/ethane ratio of 0.45 the distribution of oxygen between these combustion products was in the ratio 11 : 54 : 35.

Pressure and Yields

The primary independent variable is the ratio of oxygen to hydrocarbon. Temperature conditions are determined thereby. It is, of course, necessary to adjust conditions with a view to obtaining a temperature of at least 1300°F. if satisfactory conversion is to be obtained.

The effect on the reaction of pressure below atmospheric conditions is very small. Above atmospheric pressure, a marked effect can be discerned on ethylene yield. Thus, at 70 per cent conversion, the yield is reduced by 5 per cent on going from 1 to 3 atmospheres.

Deanesly and Watkins find that the principal effect of pressure in ethane cracking is the formation of larger amounts of by-product methane while propane pyrolysis at elevated pressures will result in the formation of by-product ethane at the cost of ethylene. The selection of pressure is not set by chemical but rather by wholly economic considerations.

The autothermic process is particularly characterised by high permissible conversion (up to 96 per cent, with a corresponding overall yield of 60 per cent, has been obtained in the case of ethane cracking). In tubular cracking processes, per-pass conversion exceeding 50 per cent is not normally recommended. In such cracking, however, overall yields (based on ethane, not on total fuel gas) are higher than is possible in autothermic processing.

Even if air is used as the combustion agent, the reported ethylene concentration of the product gases is about the same as that obtained in tubular reactors. The processing problems—by means of low-temperature fractionation, hypersorption, etc., are therefore of the same order of magnitude in both instances.

As in all hydrocarbon pyrolysis processes, acetylene is also present in amounts ranging up to 3 per cent, depending on reaction conditions. If the gas is free of sulphur compounds, this nuisance product can be removed by preferential hydrogenation, *e.g.*, over a palladium-silica catalyst.

Small amounts of oxygenated by-products—aldehydes and organic acids, introduce a nuisance problem and a caustic wash of the partial combustion products is indicated in every case.

BRAZILIAN DOCTORS' VISIT

SEVEN eminent Brazilian doctors arrived on May 31, at Northolt to study the significant advances made recently by British scientists in the fight against leprosy. In this vital branch of tropical medicine, Britain leads the world.

The visitors, all specialists in leprosy, will be shown the two newly developed British drugs—Avlosulfon and Sulphetrone—which have been notably successful in the treatment of leprosy in Malaya, India, Nigeria and other countries.

While in Britain they will visit the Pharmaceuticals Division of I.C.I. and Burroughs Wellcome & Co.—which have pioneered the new drugs, and meet the research workers in London and Manchester who perfected them. The Ministry of Health is arranging a reception at which the leprologists will meet the foremost British authorities on leprosy and tropical diseases and tours, which will take them to the chief medical teaching and research institutions, have been organised.

Britain has a particular interest in the disease since about three of the five million who suffer from it live in the British Empire. In the last few years, new treatments based on British sulphone drugs have produced marked improvements in a number of cases which had previously been considered hopeless.

The visitors are: Dr. Orestes Diniz, Dr. Jose Moacyr de Alcantara Madeira, Dr. Nelson Souza Camos, Dr. Lineu Silvera, Dr. Ary Pinto Lippelt, Dr. Walter Hadler and Dr. Jose Pessoa Mendes.

RESEARCHES ON AIR POLLUTION

BCURA's Contribution

THE average rate at which insoluble matter is deposited from the atmosphere is, in London, about 240 tons/sq. mile/yr. In other industrial areas in Britain it is as much as 460 tons.

Those hard facts are recalled by the British Coal Utilisation Research Association in an article, "Atmospheric Pollution", published in its quarterly gazette (9, 2-10), which recalls that, pre-war, Britain unquestionably led the way in the installation of gas-cleaning plant; but although our standards of technical operation bear comparison with any in the world, some of this plant has now become useless.

Installation may be difficult and costly, but it is by no means outside the range of current technical practice to devise equipment to reduce substantially the weight of the dust burden of the gases as they emerge from the stacks. To remove 60 per cent (by weight) of the dust burden may be easy; to remove 90 per cent may be practicable; to remove 99 per cent would probably be both difficult and expensive, even where sufficient space is available for installation of the plant. An immediate need is for a yardstick whereby the performance of a plant may be assessed.

BCURA has been asked to assist in devising means by which this measurement can be made, and its physics department has been concerned with this work.

The problem has been to obtain over a short period of time a representative sample of the dust burden of the stack gases, sufficient in quantity for physical and chemical examination.

High Efficiency

The department has devised a small portable instrument to extract the dust from a gas sample, with efficiency bordering on 100 per cent. The physical examination of the dust, however, is complicated by the predominance of very small particles for which no widely recognised methods of size measurement are available.

The BCURA report considers that a simple type of grit arrestor is the cyclone, in which the dust-laden gases enter at a tangent into a cylindrical chamber, usually with its axis vertical. The gas in the chamber is spun rapidly and the grit, hurled outwards by centrifugal force, reaches the walls and drops into a collecting hopper, while the cleaned gas escapes upwards through a central pipe. This equipment, it is noted, is efficient with the larger sizes of grit, but its extraction efficiency falls rapidly as the size of the particles decreases.

Small cyclones are more efficient and reach a lower limit of dust size, but have to be used in batteries. A recent development is to use a large number of very small cyclones.

Electrostatic precipitation can be more efficient than cyclone methods but may be more costly, the cost increasing steeply as the efficiency approaches 100 per cent. A plant operating at 99 per cent extraction efficiency would probably be about twice as large and twice as expensive as one of 90 per cent efficiency; moreover, some types of dust cannot be collected with efficiency approaching 100 per cent.

Gas Washing

Gas cleaning by washing can be highly efficient but has several disadvantages to offset its outstanding merit of removing most of the sulphur dioxide. To avoid corrosion of the plant and an acid discharge, it is necessary to use a suspension of chalk. When the grits have been washed down from the gas the problem remains of disposing of the sludge, the volume and weight of which greatly exceed that of the dry material.

A large power plant may consume 1000 tons of coal per week and the sulphur it contains may be sufficient to yield 20 tons of sulphur dioxide or 30 tons of sulphuric acid.

Although sulphur dioxide gas is harmful as an atmospheric contaminant, in favourable atmospheric conditions it will be dispersed by the winds, while it remains unconverted into sulphuric acid. The high concentrations of sulphate found in deposit gauges in industrial areas, however, indicate that a substantial fraction of sulphur emitted from chimneys is, in fact, converted into sulphuric acid and redeposited.

To combat grit emission, Leicester installed several years ago a powdered fuel plant at the power station in the centre of the city. The plant, however, raised the problem of handling and disposing of large quantities of dust collected. The erection of a plant to manufacture artificial stone provided an outlet for part of this material. Some has been used to cover household refuse.

World Sources and Production of Potash

Vast Quantities Await Economic Extraction

ESTIMATES of reserves of potassium have been made only for lake brines and deposits of water-soluble minerals. The most conservative estimates place the total world reserve of potash in these sources at approximately 5003 million tons, distributed as follows (in millions of tons of K_2O): Germany 2495, Palestine, Dead Sea 1143, U.S.S.R. 709, France 300, Spain 272, U.S.A. 84.

Some estimates of the German reserve are as high as 482,700 million tons of water-soluble potash. The figure for the U.S.S.R. relates to the deposits in the Solikamsk-Berezniki district and the former south-eastern Poland, but large deposits are known in other areas.

Phosphate Reserves

The known world reserve of phosphate rock and apatite is conservatively estimated 26,191 million tons, probably containing some 6400 million tons of phosphoric oxide, distributed as follows: U.S.A. 13,504, U.S.S.R. 7568, Tunisia 1500, Algeria 1016, French Morocco 1000, Brazil 572 Is. of the Pacific and Indian Ocean 182, Egypt 179, 23 countries 670.

The estimates do not include large quantities for which reasonably accurate data are not available.

The world capacity for production of potash from water-soluble sources in 1948-49 is estimated at approximately 4.2 million tons annually. Germany has the largest capacity, followed in order by the United States and France. The supply of potash is now rather below the demand, but this situation is expected soon to be remedied.

Large resources of nitrogen, phosphorus, and potassium are economically usable by present methods of recovery. Utilisation of additional huge resources of these elements awaits the development of improved processes and techniques.

The world production of raw phosphate in the year ended June 30, 1949, estimated at some 6,022,000 tons of phosphoric oxide, was sufficient to meet most demands and was approximately 60 per cent greater than the production in 1939. There is every indication that the supply will generally keep pace with the demand.

The capacity for chemically processing mineral phosphate into fertilisers is obscured by lack of information on some eastern European countries. In general, there is need of considerable increased capacity for making highly concentrated phosphates.

Water-soluble Deposits

Subterranean deposits of water-soluble minerals have supplied the greater portion of the world's fertiliser potassium for nearly 100 years. Use of these deposits is favoured by their large extent, low mining costs and the ease with which the ore can be processed, with little or no use of chemical reagents, into highly concentrated salts.

The ocean averages about 0.05 per cent of potash and contains some 6 times 10^{16} tons of K_2O. There is good prospect of the eventual development of economic processes for selective precipitation of potassium from sea water. One such process now in the pilot-plant scale, makes use of a regenerable organic precipitant.

The economic recovery of potassium from lake and subterranean brines is dependent on the simultaneous production of other chemicals.

Among the potential sources of potassium are the large deposits of potash-bearing rocks, such as alunite, lucite, feldspar, mica, glauconite, and some kinds of shales. Utilisation of these rocks has the disadvantage that the potash content, which rarely exceeds 12 per cent, is seldom amenable to concentration by physical means. Recovery of the potassium usually requires expensive chemical treatment and, with the exception of alunite, offers little opportunity for production of marketable co-products.

U.S. Potash Deposits

The glauconitic sand, Georgian shale, and wyomingite (lucite-phlogopitesanidine) deposits in the United States are estimated to contain some 778 million tons of potash. Other occurrences, some very large, include the lucite deposits of Italy and the alunite deposits of China, Korea, Transcarpathian Ukraine and Australia.

Minor, though often locally important, commercial sources of potassium include plant ash, fume and dust from cement kilns and blast furnaces, distillery waste, etc.

* Abstracted from a paper presented by K. D. Jacob at the United Nations Scientific Conference on the Conservation and Utilisation of Resources, at Lake Success, New York, and republished in the *American Fertilizer* (112, No. 10, 26).

CHARACTERISTICS OF A COOLING PROCESS

*Fundamentals of Controlled Exchange**

by LEO WALTER, A.M.I.Mech.E., M.Inst.F., A.M.I.H.V.E.

TEMPERATURE control for cooling processes is in effect heat flow control. The characteristics of any system which is to be controlled for temperature will accordingly include all the variables which can affect the temperature of the substance being processed, or which can affect the flow of the cooling medium. Some of these characteristics are inherent in the design of the plant itself, but there are others which are the result of variations outside the cooling process. These outside influences (usually designated "external characteristics") affect the final control of cooling and, consequently the choice of regulator type.

Heat Extraction

It will be clear that in every kind of cooling process any heat derived by heat transfer, from the process unit must affect the total cooling energy required. In most cooling processes heat extraction from the equipment is the process itself. Not only the amount of heat to be carried away by the cooling water flow in a given time, but also any change of cooling load influences the rate of heat extraction.

Temperature and Pressure Variation

Another "external" characteristic is a varying cooling water pressure. If a process plant is designed to use water at a pressure of 30 p.s.i., it can scarcely be called in "internal" characteristic (that is, a characteristic of the process) if the cooling water pressure varies between, say, 20 and 40 p.s.i.

The user must decide whether the process to be controlled calls for such close regulation as to make it necessary to eliminate variations in supply pressure (if this is possible), or to install more elaborate controllers which the varying supply would require. In this connection the size of supply mains is obviously important. If the size is inadequate for the required maximum rate of flow, loss of pressure within the plant unit may make the existing cooling surface incapable of meeting the maximum demand. An automatic temperature controller cannot correct this condition, which requires that the diameter of the supply main, or the supply pressure, should be increased.

Irregularities of cooling load may also add considerably to the duty of an automatic controller. Frequent and heavy load fluctuations of the process require stabilised controller types, particularly on chemical reaction vessels, scrubbers and towers with fluctuating output.

Internal Characteristics

The internal characteristics of the process requiring cooling are to a great extent a function of the plant design. Characteresitics which seem unfavourable to good temperature control can be made favourable by plant modification or a change in processing technique. Plant modifications, which might increase controllability of a cooling process might consist of change of the size of cooling surface, increase of water velocity by increased pressure head, or improved distribution of cooling water within the equipment. In all heat-flow processes, three factors, broadly, are involved:—

(1) Value of heat to be extracted (or added).
(2) Temperature difference.
(3) Time.

(1) *Total Heat.*—It is essential to know the heat value to be dissipated from the job, its "heat capacity". That can be determined by a calculation involving the weight of the substances being cooled, their specific heats and the temperature at which the cooled substance is treated.

(2) *Temperature difference.*—The rate at which heat will flow from a hot to a cooler substance depends primarily on the difference in temperature; the rate of heat flow will be greatest when the maximum disparity exists. Heat flow ceases when the temperatures coincide. For rough calculations, the "mean" temperature difference can be used between cooling water and cooled substance. Where the latter is a liquid or gas, the mean temperature will be different for counterflow or concurrent flow.

(3) *Time.*—The rate of heat flow, besides being determined by the temperature difference between cooling medium and cooled substance is affected also by the area of the surface over which the heat is being transmitted. Each cooling process

* Previous articles on this theme by the same author appeared in THE CHEMICAL AGE, 62, 159 and 267.

has a definite " process reaction rate ", which influences the choice of controller type. The heat capacity of the material being cooled is often referred to as the " cooling demand side " capacity and that of the cooling medium as the " supply side " capacity. These capacities and also the cooling surface can be shown in simple diagram form which can be made to apply to any heat-transfer process.

When the capacities of a cooling process are so proportioned that the inherent self-regulation is inadequate to hold the temperature within permissable limits, the process calls for temperature control, manual or automatic. Self-regulation is the tendency to restore heat balance, which has been disturbed.

Change of Capacity and Controllability

In many processes, the capacity (amount of stored heat) changes at different stages of the process. A simple example is a water-cooled storage vessel in which the demand side capacity, varies according to draw-off of cooled liquid. Demand side capacity (for cooling) may at times be high, but may become low during storage periods. Such change may, of course, be quick or slow, according to existing process reation rate.

While the cooling surface and supply side capacity must be adequate for full load conditions, both will be oversized when the load is low. It is here that automatic cooling control plays its part.

It is possible the the same percentage change in demand may have much less effect on the water flow temperature than the same percentage change in the cooling supply. The reason is that the quantity of heat involved in a 1 per cent change in supply capacity (i.e., cooling water flow) may be 20 times greater than a 1 per cent change on the demand side (cooled substances).

The low load condition gives the cooler an unfavourable demand side capacity. Such a process characteristic, or such changes of conditions during a process, call for careful consideration when installing automatic temperature control, and usually they require power-operated gradual controller types.

The speed at which a change in temperature can be checked and the original temperature restored depends upon the process capacity lags and the lag in heat transfer across the cooling surface. A change in heat extraction is brought about by increasing the temperature difference across the cooling surface: in other words, by lowering the mean temperature at the cooling surface on the supply side.

This, of course, automatically increases the supply side capacity—the rate of flow of cooling water becomes excessive. If the supply side capacity then becomes too great in relation to that of the demand side, the residual cooling effect at the supply side will cause an underrun of temperature at the demand side after the required temperature has been attained. If the heat transfer now indicated should be retarded by a lag accross the transfer surface the underrun will tend to be even greater.

A relatively small supply side capacity, on the other hand, would retard the recovery of the demand side temperature but would also reduce the temperature underrun when the required temperature has been reached. All these factors influence the accuracy of control.

A typical example for a difficult control problem, due to extremely small supply side capacity, is a film-type heat exchanger, capable of being used for chemical reactions, as condenser, or for cooling of jacket water from IC.

In such vertical exchangers the cooling water from the top chamber is distributed in a thin film against the inner tube walls and baffles in the shell produce high velocities and relatively high heat transfer. The volume of the thin films of cooling water is much smaller than the liquid to be cooled, or the heat content of gases to be condensed, and any decrease of heat makes necessary a very vigorous change of thickness of water film and input. Controllability of this otherwise efficient apparatus is low, and stabilised controller types will be required for achieving satisfactory temperature control.

(To be continued)

Nitrogen-Free CO_2

A FRESH application of the fluidised bed principle, used with marked success to produce high-octane petroleum, is claimed in the U.S.A. to yield highly pure carbon dioxide. Workers of the Massachusetts Institute of Technology (W. K. Lewis, E. R. Gilliard and M. P. Sweeney) described at the recent Boston meeting of the American Institute of Chemical Engineers the making of nitrogen-free CO_2 by reacing coke with iron ore, the latter providing relatively pure oxygen to unite with the carbon of the coke. The two materials, in powder form, are fluidised during the reaction by a stream of pure CO_2. The used ore, stored, regenerates itself naturally. A further development of the fluidised bed reported at the same meeting by workers of E.I. du Pont is a small electrical probe which records any irregularities, bubbles or conglomerations in the powder stream.

PHOTOMETRIC STUDIES OF CEMENT

Simplified U.S. Method of Alkali Determination

THE content of sodium and potassium oxides in portland cement seriously limits its use in several directions. For example, where the cement is to be combined with crushed rock or gravel to make concrete, the alkalis may react with soluble silica present in the aggregates. This causes expansion of the concrete, resulting in the formation of cracks and weakening of the structure.

While it is highly necessary that the alkali oxides in portland cement and raw materials should be accurately determined, the usual gravimetric procedures for doing this are wasteful of time and require the services of specially trained technicians. Seeking a more convenient and practicable analytical procedure, W. R. Eubank and R. H. Bogue, of the U.S. National Bureau of Standards, recently completed an extensive study of the method of flame photometry. Their results indicate that this technique holds considerable promise for the rapid and accurate determination of alkalis in portland cement.

The method has now been adopted by the U.S. Federal Specifications Board as an Alternate Standard, and by the American Society for Testing Materials as a Tentative Standard, for the determination of Na_2O and K_2O in portland cement.

In the method of flame photometry, the solution to be analysed is directed in a highly atomised state into a flame. The light characteristic of each element to be determined is isolated, and its intensity is measured. In this way the principles of analytical spectroscopy are applied under conditions that allow rapid determinations to be made with relatively simple apparatus by people having only moderate training.

The Flame Photometer

In the bureau's investigation, a group of five cements was subjected to repeated analysis for Na_2O and K_2O by means of the flame photometer over a period of several weeks. The results, expressed as percentages of Na_2O and K_2O, were highly consistent. The standard deviation varied from 0.005 to 0.017 for Na_2O and from 0 to 0.023 for K_2O. The maximum spread for any cement was 0.05 per cent for Na_2O and 0.06 per cent for K_2O.

To determine how the human element affected these results, the flame-photometric data obtained on a series of cements

A sample solution containing the cement constituents is poured into the photometer in which the light characteristics of the atomised material on meeting a methane flame are recorded on the scale in the face of the instrument

by three operators using two different units of the instrument were compared. The average maximum variation from operator to operator was only 0.03 per cent for Na_2O and 0.04 per cent for K_2O. That relatively small discrepancy was considered evidence that a highly trained operator is not necessary.

Use of the flame photometer in this work requires standard solutions of known alkali concentration, which provide the basis of reference in each determination. These must be so constituted that the excitations they produce in the flame are similar to those produced by the solutions to be analysed. The ideal standard solution would thus be composed of the same elements in about the same concentrations as the cement solutions to be analysed. Such standard solutions could be approximated by the addition of definite amounts of sodium and potassium chlorides to a cement solution having a known low alkali content.

There are, however, serious objections to the use of a cement for making up the standard solutions. In the first place, cements containing less than 0.1 per cent

of both Na_2O and K_2O are not commonly available. Furthermore, any error in the content of those oxides as determined gravimetrically would be reflected in all subsequent photometric determinations. Lithium oxide, if present, will introduce an error in the gravimetric value for Na_2O, which, as commonly determined, includes any Li_2O that is present.

A series of standard solutions was therefore prepared containing calcium ion and hydrochloric acid in approximately the same concentration as would occur in the solutions of portland cement to be analysed. When these standard solutions were used the values for Na_2O and K_2O obtained with the flame photometer were in excellent agreement with those obtained by gravimetric analysis. The bureau is therefore recommending the CaO-HCL solutions as standards in this technique.

An important consideration in using the flame photometer is that the gas must be of constant composition and pressure and free from materials that may interefere with the spectral emission. For alkali determination it should also provide a flame temperature that will readily excite the alkali elements without affecting other elements that require higher temperatures for excitation. Propane was found to be nearly ideal for exciting the alkali elements with a minimum of interference from other causes.

The internal-standard procedure, often employed in spectrographic determinations, is sometimes used with the flame photometer. In this, employing a dual optical system, the emitted light-intensity ratios of the element sought and of another element introduced in known concentrations are measured, rather than the absolute light intensities of the element sought, as in the direct-intensity method. The disturbing effects caused by gas and air-pressure fluctuations, the presence of foreign ions and molecules and viscosity differences are thus minimised. The bureau made a comparative study of the relative advantages of the two procedures.

In either case the flame-photometric results compared with the values obtained by gravimetric analysis. However, the bureau does not recommend the internal standard method for determination of the alkali oxides in portland cement. Its weakness lies in the introduction of a fixed amount of lithium to both the standard and unknown solutions in order to obtain intensity ratios of the alkali elements to the standard. As lithium is unfortunately present in some raw materials that may be used in cement manufacture, the reliability of the internal standard method would be uncertain.

New Analytical Method for Aluminium

THE usual method for polarographic determination of aluminium depends on the direct reduction of the ion in a slightly acid solution.

This has the disadvantages that the adjustment of hydrogen ion concentration must be made very carefully, that many substances interfere and that the measurement of concentration is difficult to make accurately.

A new method, depending on a catalytic reduction in the presence of a large excess of bromate, was described by Dr. G. Jessop in a paper presented to the Physical Methods Group of the Society of Public Analysts at a recent meeting held at Cambridge.

The reduction curve obtained by this system occurred at a comparatively low potential and was not seriously affected by small variations in the hydrogen ion concentration.

Interference by other substances was less than in the usual method and the measurement of aluminium concentration could be made more accurately.

Satisfactory results could be obtained in the presence of nitrate or iodate, but with these the conditions had to be regulated much more carefully than with bromate.

The record gave two steps at -0.35 v. and -0.78 v. *versus* the saturated calomel electrode in 0.1 mole potassium chloride. The second step is used for the measurement of aluminium. The first is due to hydrogen ion and disappears at about *p*H 4, but at this acidity the aluminium step is not suitable for quantitative measurement.

Satisfactory results were obtained with concentrations of aluminium between 0.01 and 0.5 mg. per ml. The height of the aluminium step was not quite linear with concentration over this range and a calibration curve was necessary.

Industrial Metal Uses

AN exhibition, arranged by the Institution of Metallurgists, will be opened at the Science Museum, South Kensington, from July 7 to September 30. The complete story of the extraction, refining and uses of industrial and rare metals will be illustrated by means of photographs, samples, apparatus and models. Admission to the exhibition will be free.

OVERSEAS CHEMISTRY AND INDUSTRY

COMPLEX CHEMICAL COMPOUNDS

Representative German Views

ONE of the most far ranging reviews of German contributions to contemporary themes of fundamental chemistry is presented in a recent issue of *Augewandte Chem.* (May 20, 62), which commemorates the 75th birthday of Prof. Paul Pfeiffer, one of Germany's principal workers in the field of chemical complexes.

Prof. Dr. Fr. Hein, of Jena University, reviews recent progress in the chemistry of inorganic complex compounds, distinguishing the normal from the "penetrative" (*durchdringend*) complexes, with correspondingly different kinds of electronic bonds. In the former (normal) complexes the ions and dipoles are attached electrostatically to the central ion, constituting in the Werner sense a uniformly active field of force. In the "penetrative" complexes polarisation is characteristic, and these are regarded by the author as the more typical complex compounds.

He treats at some length the carbonyl complexes (metallic) and their structure, hydrogen-or alcohol-combinations, and the nitrosyl compounds, with an interesting section on water-analogous solvent systems. As is well known in the case of water, in addition to simple hydration, complexes are formed with water as bond, and these aquo-complexes, in reaction with yet more water, tend to act as acids and split off protons, thus establishing equilibrium as hydroxo-complexes.

The analogy of this acid formation, *e.g.*, in such cases as boron trifluoride and tri- or tetra-chlorides of gold and platinum, with that of known acid anhydrides like SO_3, has suggested the idea of anhydro-acids, which require the action of water to yield aquo-acids as actual real acids. Among such anhydro-acids are to be included also the metal hydroxides. Other analogous examples are furnished by alcohol, liquid ammonia and sulphur dioxide.

Organo-Metal Compounds

The complex structure and formation of organo-metal compounds based on the phenyl-chrome complex, the relations between complex chemistry and intermetallic combinations, and hydrogen bonds in inorganic compounds of the higher series, are discussed.

In his paper on the chemistry of complex reactions in water and in liquid ammonia, Prof. Dr. O. Schmidtz-Dumont, of Bonn University, deals in more detail with reactions already noted by the previous author. The first part of the paper given here covers two groups of reactions—(a) in which the water molecule as such takes part, and (b) those in which H_3O^+ or OH^- is the real reactant or bonding medium.

Hydrate formation and addition compounds are discussed and the view is expressed that, despite the relatively small number of clearly understood or defined cases of addition hydrates, one conclusion is justified. This is that primarily they may be formed by the action of water on metal halogenides with molecular lattice (structure), and in some cases also with other types of structure; and again (probably) in reactions with non-metal halogenides, so long as the electronic valency of the central atom remains not entirely satisfied.

The author also discusses under the heading of aquo-reactions *Aquotisierung* various cationic or anionic acido-complexes.

Metal Powder Technology

THE production of fine metal powders by hydrogen reduction is the subject of a full-length study by M. Petrdlik, reproduced by *Hutnicke Listy*, (5, 3, 105-111). The author examines in detail the conditions for a complete reduction of the oxides of W, Mo. Fe, Ni, Co, Cu and Pb as a method of producing fine-grain metal powders.

The reduction is carried out in an electric tube furnace fitted with heating spirals and affording two temperature zones. The material to be reduced flows uninterruptedly through the furnace, while the reducing hydrogen flows in the opposite direction.

The author presents a method of calculating the water vapour concentration in the reducing atmosphere from the real conditions of the continuously working furnace, as well as a calculation of the composition of the intermediate products of reduction (of various degrees of oxidation) based on the oxidation number.

RISING OUTPUT IN NORWAY

Chemicals and the Five-Year Plan

CHEMICAL and allied industries in Norway made substantial progress last year. The nickel, aluminium and ferro-alloys industries now have a much higher output than before the war.

This is reported in *Foreign Trade* (7, Nos. 175, 880), by S. G. MacDonald, Commercial Secretary for Canada, writing from Oslo on the stimulus to Norwegian industry of the country's five-year rehabilitation plan.

150,000 Tons of Nitrogen

He records that the nitrogen industry is now geared to produce 150,000 tons annually, compared with less than 90,000 tons in 1948. A new superphosphate plant belonging to the Norske Zinkkompani has been completed and is in operation; the urea plant of Norsk Hydro is under construction and production is planned later in the year; and the Odda Smelteverk is extending its production of carbide.

The mineral oil refinery at Vallo, destroyed during the war, is now being rebuilt and should be in operation within a year.

Investments in the herring oil factories have expanded the capacity of the oils and fats industry by about 26,000 hectolitres per 24 hours, an increase of 10 to 15 per cent. Much of this expansion took place in 1949.

Large investments have been made in the wood-refining industries to rationalise production and to extend operations to more advanced stages of processing. Much new equipment has been purchased and installed, resulting in greater production and improved quality.

The capacity of the cement industry was increased some 10 per cent and it is anticipated that a quantity nearly equivalent to pre-war years will be available for export in 1950.

Insecticides for the East

THE World Health Organisation, in a communication to member States in the East, requested them to facilitate the free flow of insecticides into and between their respective countries by the lifting of trade barriers. It also expressed its readiness to assist under-developed countries in embarking on the production of insecticides.

Following this assurance, Ceylon's director of medical and sanitary services has

(*continued at foot of next column*)

AUSTRIAN REVIVAL

Substantial Fertiliser Exports

AUSTRIA is making great efforts to expand and diversify her chemical production. According to recent Austrian Press reports, it has been possible to start the manufacture of several new products, including aluminium sulphate, an important material for Austria's large paper manufacturing industry. Output of this compound is stated to cover home requirements. Manufacture of aluminium acetate has been resumed. Other new products are sodium fluoride and sodium pyrophosphate.

The important Linz (Upper Austria) nitrogen works last year produced nearly 300,000 metric tons of nitro-chalk fertiliser and it is expected that output for the current year will aggregate about 360,000 metric tons. Exports last year totalled 211,500 metric tons, but if exports throughout this year can be held on the high level achieved in the first quarter—135,000 tons—the year's total will be in the neighbourhood of 550,000 metric tons.

Growing Markets

Exports are directed chiefly to Poland, Spain, Czechoslovakia, Jugoslavia, Holland, Greece, Sweden, Finland, France and Italy. There have been some shipments to the Near East and a recent contract provides for the shipment of 30,000 metric tons of nitro chalk to the southern part of Korea. Part of the payment will be made in U.S. dyestuffs, made available by the U.S. authorities.

The works has also taken up the manufacture of pharmaceutical products made formerly by the I.G. Farben group. Additional sulpha drugs and other specialities are to be introduced.

Current development plans are for the production of wetting agents and insecticides, additional chemical fertilisers, including ammonium sulphate, phosphate and compound fertiliser, and one based on peat. The board is planning to erect a sulphuric acid plant to employ gypsum.

suggested the establishment in that country of a DDT factory. The Department of Industries, however, has questioned the feasibility of this as the raw material would have to be imported. The director further suggested that the Health Ministry should explore the possibility of acquiring for Ceylon, through the WHO, a monopoly of the production and sale of DDT in the East.

DETECTING AMMONIA LEAKS

Some New Photo-Electric Methods

TYPICAL examples of the practical use of photo-electric methods in scientific instrumentation are provided by a number of recent equipment items. These include a smoke density indicator. Variations of this equipment are employed for a number of other purposes, such as the control of the turbidity of liquids, the detection of sediments in liquids, or detecting the presence of impurities such as carbon dioxide.

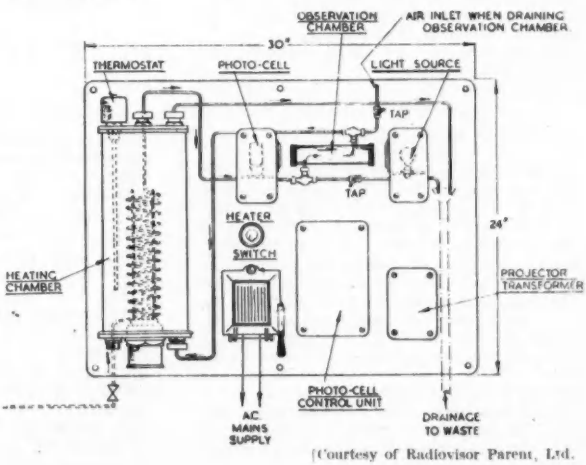
In the last case, a sample of the liquid would be continuously by-passed through a solution containing lime, when the presence of carbon dioxide would result in a cloudy appearance, the density of which, *i.e.*, the amount of carbon dioxide present, can be easily measured by the degree of obscuration of a beam of light projected through the liquid. The design of the equipment may be such that it can be arranged to ignore the presence of bubbles. In the event of the presence of excessive impurities, the equipment may be arranged automatically to shut down the plant when a predetermined figure is exceeded.

Similar principles have been adapted for the detection of ammonia leakage in air conditioning plant, where direct cooling of the spray water is accomplished by means of an ammonia system without an intermediate brine or cooling medium. Detection is based on the fact that water containing lime salts, particularly calcium carbonate (temporary hardness), becomes turbid when made alkaline with ammonia, especially at temperatures in the neighbourhood of 60° C. A sample of the water is therefore by-passed continuously from the chilled water system through a suitable heater and observation cell, where any change of turbidity is detected by a photo-electric light-sensitive cell and light-ray relay apparatus.

The water is heated by transit through a copper spiral immersed in a water jacket through which the heated water, after observation, is re-circulated and kept to the desired temperature by an adjustable thermostat and immersion electric heater. The heater is rated at 1500 watts, but is in circuit only intermittently, depending on the water input temperature and rate or flow required. The equipment normally deals with a flow of approximately 200 c.c. per min., raising this to a suitable re-action temperature from normal continuously, and under these conditions gives an alarm in less than one minute from the time at which ammonia-contaminated water enters the heating spiral.

The apparatus responds to ammonia concentrations barely perceptible by smell in the water and functions with very little attention and maintenance expense due to

(continued overleaf)



Showing the general arrangement of a contemporary ammonia leakage detector, which will give a continuous monitoring service and arrest the process or sound an alarm should a relatively small quantity of ammonia be present in cooling water

(Courtesy of Radiovisor Parent, Ltd.

Radio-Emission Gauging

*Principles of New Industrial Aids**

THE growing acceptance in many industrial processes of radioactivity measurement systems as a gauging appliance has gained further stimulus from some of the recent displays at the BIF and elsewhere.

A representative account of the character and capabilities is the technical description of the Ecko radioactive thickness gauge* which lends itself to the measurement and monitoring or continuous recording of metal or acrylic sheet. For thickness measurement it depends, at present, upon use of thallium$_{204}$.

The basic principles are these: By utilising the effect of the absorption of radioactive particles and rays in material an equipment may be constructed which can be calibrated in thickness for all forms of sheet or strip materials from very thin paper to thick sheet steel. There is no need for mechanical contact and the main advantages are apparent when it is used to measure material which is continuously flowing, *e.g.*, paper, plastics, brass, steel, etc. Several methods are available, three of which are of chief interest at present.

In the first, a single source and a single ionisation chamber are used. The material to be measured is placed between the two, and an electrometer connected to the ionisation chamber will show a current reading which, regarding the source strength and chamber geometry as a constant, will depend upon the mass of the material between them.

In the second and third methods, the standing ionisation current is cancelled out, by using respectively a stable reference potential or an identical source and chamber connected in opposition. The electrometer will now read the change in ionisation current caused by variations in the mass of the material being measured. In the second method a dial may be calibrated directly in weight and by means of a chart this can be translated into thickness. The third method is extremely useful when dealing with a long run of one type and thickness of material.

With any of these methods a sensitive current detector is required and this usually incorporates a d.c. amplifier. Due to the fact that zero drift of d.c. amplifiers is very high in relation to the minute currents to be measured, vibrating reed electrometers have been developed for this application and have much higher stability. Using such an electrometer, the drift per day will not exceed 0.5 per cent of the measured thickness.

The Ecko instrument which uses either the second or third principle, is a relatively new development and its full capabilities are not precisely ascertained.

The performance obtained with the standard equipment using thallium$_{204}$ as the source is said to be this:—

Material	Accuracy of Measurement for Stated Thicknesses	
	1 per cent	5 per cent
Paper and plastics	.005″—.036	.0025″—.100
Aluminium ...	.0015″—.010	.0007″—.030
Steel	.0005″—.0035	.0003″—.010
Glass	.0015″—.010	.0007″—.030

* By Courtesy of E. K. Cole, Ltd., Electronics Division.

DETECTING AMMONIA LEAKS

(*continued from previous page*)

the fact that no re-action chemicals, etc., are necessary. The light source is a standard 6-volt 18-watt lamp, and no critical focus or optical adjustments are necessary. The contacts can be used to give audible or visible alarm, or stop the circulating pumps when a leakage of ammonia occurs. The standard apparatus normally contains contacts which close only so long as the water is clear and, in addition, open to safety if the lamp, valve or mains supply fails. Thus it is impossible to put the pumps in action if the detector is not in correct working order. The equipment will also act as a warning if the water in the circulating system becomes unduly dirty or discoloured.

An interesting example of this type of equipment is used for checking the turbidity of the 36 million gallons of beer produced annually by one of the largest British brewers. The " brightness ", i.e., clearness, of the beer, varies according to the type being brewed, but must closely conform to a standard.

For this reason, a " sample " by-pass pipe incorporating a glass tube leads from each main line, the tube passing between a powerful beam of light projected on to a photo-electric cell forming part of a turbidity indicator. In the remote event of impurities in the beer, the intensity of the light falling on the cell is reduced by the cloudiness of the beer, thus varying the amount of current produced by the cell.

· PERSONAL ·

Mr. J. Brough

MR. T. H. REDFERN, chairman and managing director of Redfern's Rubber Works, Ltd., was elected on June 1 as president of the Federation of British Rubber Manufacturers' Associations for 1950-51. He succeeds Mr. G. E. Beharrell, deputy chairman and managing director of the Dunlop Rubber Co., Ltd. Mr. Redfern has in the past 20 years served in many offices of the rubber manufacturers' organisations and was recently deputy chairman of the employers' side of the National Joint Industrial Council of the industry for three years and continues to serve as chairman of the Labour Relations Conference and as vice-president of the Research Association of British Rubber Manufacturers.

LT.-GENERAL SIR W. G. LINDSELL, having found it necessary to curtail his activities, has relinquished the chairmanship of the board of Petrochemicals, Ltd. He will continue to be associated with the group as a director of Petrocarbon, Ltd., and Manchester Oil Refinery, Ltd. SIR ROBERT RENWICK has been appointed a director and elected chairman of Petrochemicals, Ltd.

MR. LESLIE GRAHAM, formerly marketing director, has been appointed deputy chairman of the Northern (N & C) Division of the National Coal Board in succession to MR. R. W. PARKER who has resumed his activities with the Scottish Divisional Board, from which he was temporarily detached.

MR. J. S. BROUGH is the newly appointed manager of engineering to Monsanto Chemicals, Ltd. He has been acting as assistant manager of engineering since January and originally joined Monsanto as a chemical engineer at the Ruabon works in 1945. MR. W. M. COOPER, who has been manager of engineering since 1946, becomes assistant to the managing director, to advise generally on engineering problems and to handle external engineering works in which the compay has become active.

The Minister of Supply has appointed SIR WILLIAM A. STANIER, F.R.S., as chairman of the board of directors of Power Jets (Research & Development), Ltd., of which he has been a director since 1944. In 1942 Sir William, a past president of the Institution of Mechanical Engineers, was appointed scientific adviser to the Ministry of Production. He now holds this appointment with the Ministry of Supply as well as several other offices.

"Small Information Services in an Industrial Undertaking" is the subject of a paper to be read by MR. A. H. RAINE, of Brotherton & Co., Ltd., Leeds, at a northern branch meeting of ASLIB, at the Harris Public Library, Preston, on June 16, at 2.30 p.m. The chairman will be MR. R. BRIGHTMAN.

SIR EDWARD APPLETON has been awarded the gold Albert Medal of the Royal Society of Arts for 1950 for "outstanding services to science and industrial research." The medal will be presented privately, in the autumn, by Princess Elizabeth, president of the society.

Evans Medical Supplies, Ltd., has appointed MR G. T. RANDALL DAVIES, as export manager at the head office, Speke, Liverpool, and MR. A. K. BRIEN, as overseas representative with headquarters in Cairo.

A dinner in honour of DR. L. J. SPENCER, who in October will have completed 50 years as editor of the *Mineralogical Magazine*, is to be given on November 2 by the Mineralogical Society. A presentation of a personal nature will be made.

MR. C. PINKHAM, manager of the publicity organisation of The General Electric Co., Ltd., is retiring on June 30, after 37 years with the company.

VERSATILE WELDING PLANT

Philips' Exhibits at Harrogate

SOME noteworthy innovations in welding plant will be displayed by Philips Electrical, Ltd., at the British Electrical Power Convention Exhibition, at Harrogate from June 19-23.

Of interest among these is a portable a.c. welding transformer, type E1381/1. It is a general-purpose plant, suitable for such applications as light and medium fabrications, sheet-metal welding, maintenance work, etc. The welding current control is continuous over the range 15-200 amp.

Compact and of rigid construction, it is a mobile equipment, easily wheeled wherever it is needed. For continuous welding it is suitable for use with 10 to 18 SWG electrodes; for intermittent welding it requires 8 SWG electrodes. Input links enable the equipment to be easily adjusted to 200, 225, 400 and 440 volts, on single phase supplies or between two phases of a 3-phase system.

Portable Welding Transformer

A high-capacity welding transformer, type 1368, also being shown, has infinitely variable adjustment over the current ranges 70-170 amp. and 170-350 amp. Also portable, it is suitable for use with electrodes from 12 SWG to 5/16 in. and is for light, medium and heavy fabrications.

Philips 56 is a low-hydrogen electrode, designed for the welding of low alloy, high tensile steels. The lime-fluorspar coating makes the electrode insenstive to carbon and sulphur in the base material, so that sound and clean welds are obtained. The mechanical properties obtained are: 36 tons/sq. in. ultimate strength; 35 per cent elongation on 2 in.; 80 per cent reduction of area; and 90 ft./lb. Izod impact value. Because of the very low hydrogen content of the weld metal, very little weld metal/parent metal junction cracking can occur, even with relatively highly alloyed steels. Weld metal with good impact properties at —70°C. can be produced.

The RSM electrode is for the welding of highly-alloyed austenitic chromium nickel steels of the stainless steel types, containing about 18 per cent chromium and 8 per cent nickel. The presence of 3 per cent molybdenum makes it suitable for the welding of stainless steels containing molybdenum in small quantities, or as in FMB, etc. This electrode is said to be of value in applications where high resistance to acid corrosion is needed, as in the chemical industry.

TECHNICAL PUBLICATIONS

New Laboratory Appliances

SOME of the latest trends in weighing technique are exemplified in new models of Stanton balances described by Griffin & Tatlock, Ltd., in a leaflet now available. Other leaflets just issued by this company cover a universal laboratory stirrer incorporating many new features; Pyrex brand $\frac{3}{8}$ in. bore glass pipe lines for permanent laboratory installations; and a cylindrical design oven for drying, incubating or sterilising with automatic temperature control over the range of 35-220° C.

* * *

TO meet industrial demands for pressure and vacuum processes, a new pressure control instrument, suitable for low, medium or high pressure duty has been developed by the British Thermostat Co., Ltd. This is the Teddington Type QY, described in the company's leaflet N.S.17. The instrument is supplied with three standard adjustable ranges between the limits of 28 in. Hg. vac. and 250 p.s.i. Range adjustment is outside the case; inside, and easily accessible, are the calibrated range scale and a graduated differential adjustment.

* * *

WORLD statistics of copper, lead, zinc, tin, antimony, cadmium, cobalt, nickel, aluminium, magnesium, silver and gold are presented in a new 168-page book, "Statistiques—1948", published in Paris by the French company, Minerais et Metaux. Data in most cases provide a record since 1913 and prices are chartered for the period 1913-48. Leading producers of the different metals and brand names listed. The explanatory text is written in French. Copies of this book are being distributed by Intsel Metals Corporation, 70 Pine Street, New York City.

* * *

TALL oil rosin acids and their use for paper sizing are discussed by Svig Johanson, the Research Laboratory, Ornsköldsvik, Sweden in *Svensk Pappers Tidning* (Swedish Paper Journal, Vol. 53, No. 10), official organ of the Swedish Paper Mills Association, Swedish Association of Paper and Cellulose Engineers, etc.

* * *

CHEMICALS and metals (including alloys other than ferro-alloys), unwrought, are included in the schedule of goods listed under a further Open General Licence (Notice to Importers No. 379) and amendments to previous notices effective from June 1, published in the *Board of Trade Journal* (Vol. 158 No. 2789).

HOME

Duty Exemption

The Treasury has made an order exempting cerium oxide, pure, and 2-ethylhexyl alcohol from key industry duty for the period June 5 to June 30.

Coal Production

Output of coal in Britain last week was lower on account of the Whitsun holidays. The total was 3,089,800 tons compared with 4,069,500 tons in the previous week and 3,046,000 tons in Whitsun week last year. For the first time for over three years mining manpower has fallen below 700,000—to 699,800.

U.K. Light Metal Statistics

Ministry of Supply statistics relating to U.K. production, imports and consumption of light metals in March include the following (in long tons): Virgin aluminium: production 2662, imports 5561. Secondary aluminium: production 7745. Aluminium scrap arisings 8669; consumption 11,348. Aluminium fabrication 20,619; foil 977. Magnesium fabrication 336.

Summer School in Electron Microscopy

A summer school in electron microscopy will again be held this year in the Cavendish Laboratory, Cambridge. Lectures will deal with the fundamental theory and operating principles of the electron microscope. The school will be held from Tuesday, July 18 to Saturday, July 29, inclusive.

Ardil Fabrics

Fabrics manufactured from a mixture of the synthetic fibre Ardil and wool were shown to members of the Scottish Board for Industry when they visited the Ardeer works of Imperial Chemical Industries, Ltd., recently. I.C.I., Ltd., has produced attractive fashion fabrics from the material, on which exhaustive tests are still being made. A factory at Dumfries will permit large-scale manufacture of the fibre when testing is completed.

Penicillin by Helicopter

The only cargo carried by the world's first helicopter passenger service, inaugurated on June 1 between Liverpool and Cardiff, was a consignment of penicillin from Evans Medical Supplies, Liverpool, to a Cardiff hospital. The despatch was in the nature of an experiment by Evans, which may lead to regular use of the helicopter service. The company's headquarters are close to Speke Airport and large quantities of medical supplies are regularly sent by air.

Toxic Effect of Extinguisher

The use of a chemical extinguisher to subdue a blaze in a test oven at Manchester Oil Refinery, at Trafford Park, was believed to have produced phosgene gas, the effects of which necessitated 30 research and drawing office staff being taken to hospital. Nine were detained.

Disputes in 1949

Industrial disputes in the chemical and allied trades caused six new work stoppages in 1949. The number of workers involved in all stoppages was 500 and there was an aggregate of 2000 days lost. These figures are low in comparison with most other industries.

Higher Bitumen Prices

An increase in the price of their proprietary brands of bitumen was announced by Shell Mex and B.P., Ltd., last Monday (June 5). The cost of Mexphalte was advanced by 7s. 6d. a ton and Shelphalt by ¾d. per gallon. Recent advances in world oil prices and increased costs of distribution are stated to be the cause of the rises.

Finsbury Technical College

Members of the Finsbury Technical College Old Students' Association are requested to communicate with the hon. treasurer, Mr. W. B. Thompson, "Elleray," Regent Road, Altrincham, Cheshire. The intention is to hold a final re-union and a winding-up meeting to decide means for disposal of the funds, amounting to £533.

Europe's Largest Oil Refinery

Mr. Philip Noel-Baker, Minister of Fuel, and Mr. R. A. Carder, chairman of the Anglo-American Oil Co., last week visited the site of the £37.5 million Esso oil refinery at Fawley, Southampton, which is expected to have an output of 5.5 million tons of petroleum products a year. Completion is not due until January 1952, but construction is so well advanced that some operations may be started in the last quarter of 1951.

Atomic Plant's Water Needs

The Rivers Dee and Clwyd Fishery Board on June 3 formed a sub-committee to take steps to oppose a scheme to take up to 20 million gal. of water from the Dee for the Ministry of Supply atomic energy plant at Capenhurst. The board is to invite local authorities concerned to join in the objection.

GREASE PRODUCTS

Profitable Recovery at Bradford

THE annual report of the Bradford Sewage Committee reveals that the sales of grease by the department from the Esholt Works amounted last year to £238,158, and fertiliser worth £22,158 was sold. During the past 42 years more than £3,660,000 has been received for grease products and fertiliser.

Research is being directed to finding additional markets for grease, in collaboration with several Government departments and trade organisations. Satisfactory business is reported from an arrangement with the largest grease firm in U.S.A., and it is thought that a wide field may exist in that market for a paler grease. Successful research has been made and trials on a plant scale are now being prepared.

An encouraging report has been received from the British Leather Manufacturers' Research Association, in whose laboratories samples of leather have been treated with the department's products and have proved indistinguishable from those dressed with the orthodox, but more expensive, types of grease.

Paints and Taxes

THE view that an increase in the price of paints throughout the industry as a whole is inevitable is contained in the statement by the chairman (Mr. B. J. Nicholson) to be presented at the 26th annual ordinary general meeting to be held in London this month.

Contributory factors were the increasing duties and taxes. It was not, in fact, generally appreciated that the recent increase of 9d. a gallon on hydrocarbon derivatives affected paint manufacture.

This increased duty, plus the tax on commercial vehicles and the increase of 3s. 4d. in the £ on rail charges and 7½ per cent on road transport charges would lead inevitably to rises in material costs.

New BAC Branches

THE Yorkshire Section of the BAC has been revived, with headquarters at Leeds. Dr. I. Pollak has been elected chairman, Mr. F. C. Collins, vice-chairman, Mr. F. Simpson, hon. secretary, and Mr. R. G. Allen, hon. treasurer. It is intended to set up branches in Sheffield, York and Hull, and probably in other centres.

Arrangements are also being made to promote the formation of a new section in South Wales, in connection with which a meeting is being held at the Mackworth Hotel, Swansea, on June 14.

NEW RUBBER INDUSTRIES

Domestic Goods and Oil

THE development of Ceylon's light industry will be taken a step further when a factory for the manufacture of rubber goods—shoes, flooring and bicycle tyres—starts production this month.

Capital for the new venture will come entirely from local investors, and the technical control will be supplied by two Chinese experts with long experience of rubber manufacture in Malaya.

A former executive of the Bata footwear group in Czechoslovakia, Mr. J. Cermak, has arrived to take charge of another rubber footwear factory in Colombo, for which machinery is expected in three or four months' time.

Hopes are entertained in Ceylon of entering the world rubber goods market soon on a large scale. At present Ceylon manufactures are being exported to Egypt, Belgium and Australia. Local manufacturers, seeking a protective tariff.

At least two more manufacturers will start large-scale production shortly. One will concentrate on foam rubber products. The threat of competition from Japan has now been eliminated by the recent decision to stop temporarily imports from Japan.

Meanwhile, experiments in the extraction of oil on a commercial scale from rubber seeds, now wasted, are to be resumed in the newly completed research laboratory at Katukurunda. Recent experiments at the Rubber Research Laboratory indicated a yield of 20 per cent oil—paint oil of high quality, according to Dr. A. Sundarlingam, Rubber Technologist. The commercial development has come to a temporary standstill because, says Dr. Sundarlingam, "now that rubber fetches higher prices people do not bother much about seed."

Canadian Synthetics Research

THAT Canada had $50 million to develop a synthetic rubber process, "then untried," to replace natural rubber when Singapore was lost to the Japanese was recalled by Mr. C. D. Howe, Canada's Minister of Trade and Commerce, speaking recently to graduates of the University of British Columbia. Since the war, he said, another $50 million had been devoted to the development of synthetic rubber raw materials and an indirect result had been the establishment of factories making fibreglass, anti-freeze, chlorine and base materials for plastics. Research, he declared, was making jobs available to thousands of Canadians.

OVERSEAS

Italian Mercury

Production of mercury in Italy last year, 1534 metric tons, was 16 per cent higher than the previous year's total.

U.S. Fuel Oil Additive

A new fuel oil additive, FOA-5X, developed by the Shell group in the U.S.A., was incorporated into domestic heating oils during 1949 and is said to have been very successful in eliminating clogging of filter screens.

More Polyethylene

The rising demand for polyethylene resins in the U.S.A. is recognised by the decision of the Union Carbide and Carbon Corporation to erect at South Charleston a new plant which will almost double the output of Bakelite polyethylene. It will operate before the end of next year.

Electro-Chemical Research

The planning committee of the Central Electric-Chemical Research Institute of India, at a recent meeting in Madras, tentatively decided that the new research institute should begin to operate at Karaikudi in 1952. The scheme for the establishment of the institute is expected to cost Rs. 4.5 million.

French Chemical Production

Sulphuric acid production in France dropped from 97,286 tons in February to 75,785 tons in March. Calcium carbide increased from 8000 to 10,852 tons, soda carbonate from 53,044 to 56,638 tons, caustic soda from 19,313 to 19,565 tons. Output of superphosphates fell from from 98,000 to 90,000 tons, and of nitrogen fertilisers from 16,800 to 15,800 tons. Powdered phosphates output, 5500 tons, was lower by 500 tons.

Lung Extract to Treat Tuberculosis

A treatment for pulmonary tuberculosis, which makes use of a chemical extract from the lung, has recently been reported in Italy, and is stated not to attack Koch's baccilli, but to have a specific action on the affected organ and to reconstitute tissue. Tests on the therapeutic. made since 1945 in a sanatorium near Rome, are said to have effected 12 cures. The formula was discovered by Antonio Damia, a chemist who worked on notes left him by a Sardinian chemist. Similar research has been carried out by two Milan scientists, who studied the theories of the Russians, Kazakov and Filatov, on the stimulating action of extracts from organs.

Indian Hard Coke Production

Because of an insufficient supply of hard coke, the Government of India has appointed a committee to study the problem and to suggest methods of meeting current and future demands.

Radioactive Isotopes

A special feature of the $1 million atomic medicine research centre, recently opened by the New York University of Rochester, is a laboratory for the handling of radioactive isotopes.

Records 7900° F.

A new recording device for measuring and controlling extremely high temperatures (up to 7900° F.) of the order encountered in atomic energy research, has been developed by the Brown Instruments Division of the Minneapolis-Honeywell Regulator Company, Philadelphia, U.S.A.

Soda Ash in Colombia

It is anticipated that the soda ash plant now under construction near Bogota will be in operation by the end of 1950. Productive capacity will be 100 tons of soda ash, 30 tons of caustic soda and 12 tons of refined bicarbonate per day. A complementary plant will produce approximately 200 tons of refined salt per day.

Indian Bauxite

Deposits of bauxite have been located by the Geological Survey of India in the Sambalpur district of Orissa. The reserves are estimated at approximately 300,000 tons. The investigation was undertaken with a view to starting an industry for the production of aluminium and alumina abrasives with the help of cheap hydro-electric power that is expected to be available in the near future from the Hirakudi project.

I.C.I. Expansion in Australia

Several new plants having recently begun production or scheduled to do so by September this year, are announced by Imperial Chemical Industries of Australia and New Zealand, Ltd. These include the £500.000 mechanisation and extension of the Nobel explosives plant at Deer Park, Victoria; manufacture of polyvinyl chloride and formaldehyde at Botany, New South Wales; and good progress of the extensions of the works and saltfields at Osborne, South Australia, where caustic soda is produced. Duplication of the plant at Osborne is now in progress at a cost of £2.5 million.

The Stock and Chemical Markets

STOCK markets have had their most active period this year, distinguished by a continued demand for industrial shares, more encouraging trade reports suggesting that many companies have reasonable prospects of being able to maintain their dividends, notwithstanding rising costs of materials. This assumption has been stimulated by reports that many companies have been able to increase turnover in export markets, although competition is growing.

The decision of British Nylon Spinners to reduce prices by over 20 per cent—evidence of expanding output and improved production facilities—is one such instance which is expected substantially to expand exports. Shares of the joint owners of British Nylon Spinners, I.C.I., Ltd., and Courtaulds, have not held their best recent levels. Imperial Chemical have eased to 40s. 10½d. at the time of writing, pending the annual meeting, from which the City expects news whether any fresh issue of capital is contemplated in the near future. Courtaulds after being 37s. 10½d. eased to 37s. 6d.

Monsanto Chemical showed firmness at 48s., and Fisons have risen further to 26s. 6d., the good yield attracting buyers. Elsewhere, the cut in dividend from 35 per cent to 10 per cent put Amber Chemical 2s. shares down sharply to 3s. 3d. F. W. Berk, however, strengthened to 15s. on the decision to distribute a share bonus of 50 per cent. Boake Roberts were 26s., Bowman Chemical 4s. shares 5s. 3d., Brotherton 10s. ordinary 19s. 6d., Pest Control 5s. shares 7s. 9d., L. B. Holliday 4½ per cent preference 19s. 9d., and W. J. Bush 5 per cent preference 22s. 3d. British Chemical & Biologicals 4 per cent preference were 16s. 6d., and Laporte Chemicals 5s. units changed hands up to 9s. 7½d.

Borax Consolidated rose to 53s. 3d., British Oxygen to 94s. 3d., United Glass Bottle put on 1s. 3d. at 73s. 9d., and there was good demand for Triplex Glass, which advanced to 23s. despite uncertainty whether the dividend will be increased at this stage. Turner & Newall were up to 84s. with the general trend of markets; United Molasses at 43s. 6d. reflected a little profit-taking, and the 4s. units of the Distillers Co. were unchanged at 18s. The view that soap rationing may be ended or modified shortly drew more attention to Lever & Unilever, which rallied to 41s. 3d. Lever N.V. were also better at 38s. 10½d.

British Xylonite fluctuated, but at 81s. 3d. were higher on balance, and shares of other companies with plastics interests were again more active, De La Rue at 25s. 9d., and British Industrial Plastics 2s. shares at 6s.

Iron and steels showed firmness, but gains were only moderate, the controversy over the Schuman plan for pooling Europe's steel and coal having had some disturbing effect. Guest Keen, however, further strengthened to 44s. 3d., and John Summers were firm at 28s. 9d. awaiting terms of the company's debenture issue. These debentures the City believes may have a right to early repayment if iron and steel were nationalised.

Boots Drug have been active around 50s. 3d., British Glues & Chemicals changed hands at the higher level of 21s. 3d. Beechams deferred moved up to 13s. 9d., and Associated Cement to 84s. 3d. Oils have been uncertain, Shell at 68s. 1½d. following publication of the full results, but Ultramar Oil were active up to close on 14s. at one time on rumours of increased output. The debentures, at 138, were substantially higher.

Market Reports

THE price position throughout the chemicals market remains steady with a tendency to be firmer, and the volume of business is satisfactory for the time of year. Changes have been comparatively few and mainly concerned with non-ferrous metal prices, further advances in copper and zinc having been notified recently. A fairly good inquiry for export has been maintained and interest has been well spread over most sections of the market. Chlorate of soda is in good request and supplies of soda ash are finding a ready outlet. The coal tar products market is without feature and the volume of business is of moderate dimensions.

MANCHESTER.—The Manchester chemical market has made a quietly steady recovery after the Whitsun holidays, so far as actual movement into consumption against contracts is concerned. The textile and other principal using industries are again calling for substantial deliveries of caustic soda and other alkalis, as well as potash, ammonia and magnesium compounds. A fair volume of new home and export buying has been reported. The undertone generally remains firm, with

(continued at foot of page 870)

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Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages or Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

J. K. Innes & Co., Ltd., Carlisle, chemical engineers. (M., 10/6/50.) May 8, mortgage and charge to Midland Bank, Ltd., securing all moneys due or to become due to the bank; charged on land with workshop at Kingmoor, Carlisle, with machinery, fixtures, etc.; also a general charge. *£600. April 15, 1949.

Lankro Chemicals, Ltd., Eccles. (M., 10/6/50.) May 5, £20,000 mort., to National Mutual Life Assurance Society; charged on leasehold property, Bentcliffe Works, Eccles, with plant and machinery. *£25,527. August 24, 1949.

Solartron Laboratory Instruments, Ltd., Kingston-on-Thames. (M., 10/6/50.) May 10, £150 debs., part of a series already reg. *£5,238. November 10, 1949.

Satisfactions

Durham Chemicals, Ltd. (formerly Newcastle-upon-Tyne Zinc Oxide Co., Ltd. and Ouseburn Trading Co., Ltd.), Sunderland. (M.S., 10/6/50.) Satisfaction May 11, of mortgage reg. Sept. 2, 1947.

Lankro Chemicals, Ltd., Eccles. (M.S., 10/6/50.) Satisfaction May 13, of mortgage reg. March 5, 1948.

Company News

F. W. Berk & Co., Ltd.

A final ordinary dividend of 25 per cent, making 42½ per cent for 1949 is recommended. This compares with 37½ per cent forecast in the prospectus of April last year. £50,123 has been transferred from profit and loss account to reserve for increased cost of replacements. An extra-ordinary general meeting will be held shortly to approve an increase of £50,000 in the ordinary capital, with which it is proposed to make a free issue of one ordinary share for each two ordinary shares now held.

Evans Medical Supplies, Ltd.

Payment is recommended of a preference dividend at 3 per cent less tax, for six months ending June 30, 1950.

Greeff-Chemicals Holdings, Ltd.

Group profit for 1949, before providing taxation, was £62,741 compared with £73,461 in 1948. After tax (£30,894) and placing £10,000 to reserve and payment of preference dividend, a final dividend of 8¾ per cent, plus a bonus of 3½ per cent, making a total of 16 per cent, less tax, is recommended.

Jenson & Nicholson, Ltd.

A final distribution of 20 per cent on the ordinary shares is proposed and a balance of £28,503 is carried forward, compared with £26,986 in 1948.

Increases of Capital

The following increases in registered capital have been announced: Haffe Products, Ltd., from £20,000 to £25,000; Jencons (Scientific), Ltd., from £5000 to £9500.

New Registrations

Lea Valley Chemicals, Ltd.

Private company. (482,604). Capital £1000. Manufacturers of chemicals, gases, etc. Directors: H. Yarrow and F. Shamash. Reg. office: 46 Finsbury Square, E.C.2.

Thomson, Skinner & Hamilton (Edinburgh), Ltd.

Private company. (27,731). Capital £10,000. Chemical manufacturers and merchants, etc. Directors are not named.

THE STOCK AND CHEMICAL MARKETS

(*continued from previous page*)

further advances in the zinc products, following the sharp rise in the metal price. Makers of sodium sulphide have increased quotations by 6s. a ton, while percarbonate and perborate of soda are dearer on balance by £1 a ton.

Glasgow.—There has been a definite slowing up of business during the past week owing to the fact that very few spot prices were available on account of the many and varied changes in price to be arranged following the increased cost of petrol and hydrocarbons and also the higher railway carriage rates. The export market shows definite signs of revival.

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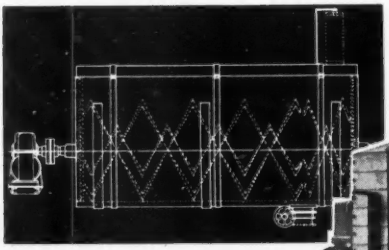

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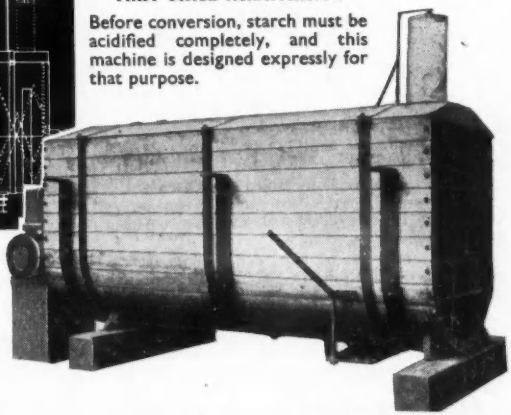

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Patent Processes in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted will be obtainable, as soon as printing arrangements permit, from the Patents Office, Southampton Buildings, London, W.C.2. at 2s. each. Higher priced photo-tat copies are generally available.

Complete Specifications Accepted

Aminoanthraquinone sulphonamides.—General Aniline & Film Corporation. April 18 1947. 639,660.

Preparation of diamines.—Sterling Drug, Inc. May 19 1947. 639,853.

Purification of pteridines.—American Cyanamide Co. May 22 1947. 639,854.

Processes for the manufacture of alkali metal hydroxides, sulphur dioxide, and sulphuric acid.—C. W. Dorbach. May 23 1947. 639,855.

Process for the production of fertilisers.—Potasse et Engrais Chimiques. June 5 1947. 639,783.

Methods of preparing 7-halogensterol-esters and 7-dehydrosterols.—N.V. Philips' Gloeilampenfabrieken. July 7 1947. 639,726.

Selective calcination of dolomite.—Dorr Co. July 8 1947. 639,668.

Processes and media for the production of streptomycin and other antibiotics.—Heyden Chemical Corporation. July 14 1947. 639,863.

Polymerising substances in the emulsified state.—N.V. De Bataafsche Petroleum Maatschappij. July 23 1947. 639,729.

Manufacture of copperable polyazo dyestuffs.—J. R. Geigy A.G. Aug. 1 1947. 639,860.

Method of rendering aluminium resistant to attack by hydrogen peroxide.—Pennsylvania Salt Manufacturing Co. Aug. 6 1947. 639,730.

Anti-foaming composition.—Dow Corning Corporation. Aug. 15 1947. 639,673.

Ethers containing a saturated carbon ring.—G. B. May, and J. W. Fisher. Aug. 20 1948. 639,733.

Protection of ferrous metal surfaces subject to contact with hot furnace gases.—W. E. Ballard, and W. F. Harlow. Aug. 30 1948. 639,676.

Dehydration of methyl ethyl ketone by distillation.—Standard Oil Development Co. Sept. 9 1947. 639,734.

Process for producing mono-alkylbenzenes, and the mono-alkylbenzenes resulting from said process.—Monsanto Chemical Co. Oct. 8 1947. 639,873.

Production of guanidine sulphates.—American Cyanamid Co. Nov. 3 1947. 639,681.

Process for removing cobalt from zinc electrolytes.—Hudson Bay Mining & Smelting Co., Ltd. Nov. 19 1947. 639,685.

Manufacture of cellulosic paper.—Bakelite Corporation. Dec. 13 1947. 639,884.

Process for the preparation of urethane derivatives of the lysergic acid ring system.—Sandoz, Ltd. Dec. 17 1947. 639,887.

Manufacture of aldehydes from ketones to β-ionone.—Roche Products, Ltd. (F. Hoffmann-La Roche & Co., A.G.). Nov. 24 1948. 639,888.

Nylon compositions.—I.C.I., Ltd. Dec. 30 1947. 639,893.

Heat-treatment of magnesium base alloys.—Magnesium Elektron, Ltd., C. J. P. Ball, A. C. Jessup, and P. A. Fisher. Dec. 16 1948. 639,808.

Detergent compositions.—P. Lunt & Co., Ltd., and J. H. Wootton-Davies. Feb. 4 1949. 639,630.

2-furoic amides of amino naphthols.—General Aniline & Film Corporation. Feb. 13 1948. 639,697.

Methods for controlling the flow of particulate solids.—I.C.I., Ltd., and E. J. Challis. March 1 1949. 639,636.

Production of articles of synthetic resinous materials.—I.C.I., Ltd., W. E. F. Gates, and A. L. L. Tompsett. Feb. 4 1949. 639,918.

Anti-corrosion oils.—Shell Refining & Marketing Co., Ltd., G. D. Galvin, and A. E. McAulay. March 12 1948. 639,814.

Preparation of substituted pteridines and intermediates thereof.—American Cyanamid Co. July 26 1946. 640,092.

Process for extracting alumina from calcium aluminates.—J. C. Seailles. Aug. 28 1946. 640,145.

Polycarboxylic acids and method of preparing the same.—B. F. Goodrich Co. Sept. 6 1946. 639,929.

Aliphatic sulphur compounds and compositions containing same.—California Research Corporation. Oct. 22 1946. 640,148.

Process of manufacturing a citrate soluble phosphatic compound, useful as a fertiliser or an ingredient thereof.—Directie Van De Staatsmijnen in Limburg. Nov. 5 1946. 640,149.

Process of manufacturing a citrate soluble phosphatic compound, useful as a fertiliser or a fertiliser ingredient.—Directie Van De Staatsmijnen in Limburg, H. De Bruijn, and M. H. R. J. Plusje. Dec. 5 1946. 640,237.

Water-repelling organo-silicon products.—Soc. Des Usines Chimiques Rhone-Poulenc. April 11 1947. 640,162.

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For free literature about iodine and its potential applications write to the Chilean Iodine Educational Bureau, a non-commercial organization sponsored by the producers of Chilean nitrate and iodine.

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Candidates must be at least 30 years of age on 1st January, 1950. They must possess an Honours Degree in Physics with Chemistry as a subsidiary subject, or an Honours Degree in Chemistry with Physics as a subsidiary subject, and must have had at least five years' experience in industrial research.

Inclusive salary scale, £750-£1,000.

Further particulars and application forms from the **Secretary, Civil Service Commission, Scientific Branch, 7th Floor, Trinidad House, Old Burlington Street, London, W.1,** quoting No. 3126. Completed application forms must be returned by 28th July, 1950.

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Candidates must have 1st or 2nd Class Honours degree in chemistry or equivalent qualification with considerable experience of inorganic analytical chemistry including the development of methods, using classical and modern techniques. Other candidates who possess high professional attainments may be admitted.

Candidates must have been born on or before 1st August 1919, but the Senior Scientific Officer post (and similarly graded scientific posts in other Government Departments) is also open to candidates born between 2nd August 1919 and 1st August 1924 (inclusive) through the Open Competition under Normal Regulations already announced (No. 2887). Salary scales (male) Principal Scientific Officer, £910–£1,177, Senior Scientific Officer, £670–£860. Rates for women somewhat lower. Post carries benefits under Federated Superannuation System for Universities.

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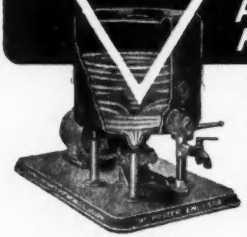

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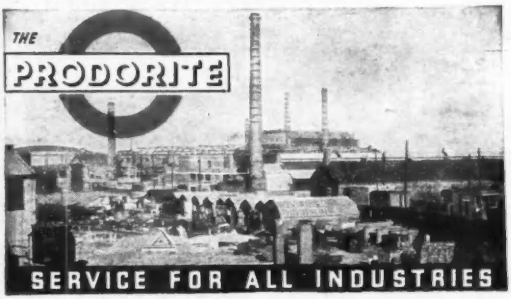

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